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The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

METROPOLITAN DISTRICT COMMISSION

FOR THE YEAR 1931





MEMORIAL DRIVE UNDERPASS — LOOKING EAST



MEMORIAL DRIVE UNDERPASS — LOOKING WEST

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REPORT OF THE METROPOLITAN DISTRICT COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled.

The Metropolitan District Commissioner has already presented to your Honorable Body an abstract of the account of the receipts, expenditures, disbursements and liabilities of the Metropolitan District Commission for the fiscal year ending on November 30, 1931, and now, in accordance with the provisions of section 100 of chapter 92 of the General Laws, presents a detailed statement of its doings for the calendar year ending on December 31, 1931.

TWELFTH ANNUAL REPORT

I. Organization and Administration

COMMISSION, OFFICERS AND EMPLOYEES

The term of office of Frank A. Bayrd expired on November 30, 1931 and on December 9, 1931 Melvin B. Breath was appointed to fill the vacancy. The membership of the Commission at the end of the year was as follows: Davis B. Keniston, Commissioner, George B. Wason, William F. Rogers, Charles H. J. Kimball and Melvin B. Breath, Associate Commissioners.

William E. Whittaker has continued as Secretatry of the Commission and the following as Directors and Chief Engineers: of Park Engineering, Edwin H. Rogers; of the Sewerage Division, Frederick D. Smith; of the Water Division, William E. Foss.

The maximum number of employees during the year was 2,293, divided as follows: general offices, 41; parks, 1,030; water, 415; sewerage, 264.

II. General Financial Statement

Year ending November 30, 1931

Expended for construction	\$2,065,947.43
Expenditures, miscellaneous	164,123.91
Expenditures for maintenance	4,790,755.90
Total expenditures	7,020,827.24
Unexpended balance, maintenance appropriations	1,364,597.20
Serial bonds and notes issued	1,300,000.00
Serial bonds and notes paid	856,687.50
Increase in sinking funds	2,183,415.68
Decrease in net debt	1,740,103.18

On November 30, 1931

Net debt	\$28,943,370.02
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III. Construction

Work was continued during the year on the New Neponset Valley Sewer extension to the towns of Canton, Norwood, Stoughton and Walpole. The work upon Sections 109, 110, 111, 112, 113, 115 and 116, 35,480 feet in length, was completed during the year except a small amount of backfilling and other work.

Section 114, 5,800 feet in length, was started in 1930 and 4,404 feet had been completed at the end of the year. Contracts for Sections 117, 118, 119 and 120 were awarded during the year for a total length of 17,550 feet of which 5,548 feet have been constructed. Section 121 is the only remaining section upon which work has not started and this will be let early in the coming year. The entire work will be completed in 1932.

The Town of Weymouth at its meeting of town-meeting members held in March voted to accept the provisions of Chapter 419 of the Acts of 1930. This action was negatived by the voters of the town upon a

petition for a referendum vote. The Attorney General advised the Commission that the action of the town-meeting members made the act effective and that the town thereupon became a member of the South Metropolitan Sewerage District. Accordingly, Section 125 of the Braintree-Weymouth line was awarded in November. This section is 3,620 feet in length, the greater part of which is in the crossing of the Fore River Basin.

The construction of the sub-structure and reservoir for the pumping station at Newland Street, Squantum, for the Squantum section of Quincy, was contracted for during the year, and a contract placed for the pumping units for the station.

Chapter 381 of 1931 authorized the extension of the Metropolitan Sewer in the North District in Mill or Sucker Brook Valley from a point in Forest Street in Arlington to Park Avenue, Arlington. Plans were completed during the year and a contract let for this work in December.

A syphon connection 100 feet in length has been made under the Aberjona River near the Wedgemere station of the Boston and Maine Railroad, replacing the connection previously removed above the river of the old Mystic Valley Sewer.

Work upon the new Weston Aqueduct supply main was continued during the year. Three new sections have been laid, 24,541 feet in length extending from Wexford Street, Brighton to North Beacon Street along Charles River Reservation, Boston and Newton and through Maple, Galen, Centre, Pearl, Peabody and Washington streets to Elm Street, Newton.

Venturi meters have been installed in North Harvard Street at Spurr Street in Brighton, in Washington Street at Watertown Street, Newton, at Church Street, Newton and in Marginal Street at Eastern Avenue, Chelsea.

The following contracts in the Parks Division, started in 1930, were completed during the year:

Construction of Quincy Shore Boulevard, formerly known as Pilgrim Boulevard, from Furnace Brook Parkway at Black's Creek to Sea Street, Quincy.

Drainage improvements in Malden, Everett and Revere.

Reconstruction of Fellsway West from Elm Street, Medford to South Street, Stoneham.

Resurfacing South Border Road, Medford and Winchester.

Construction of traffic circle at the junction of Middlesex Fells Parkway and Revere Beach Parkway, Medford.

Surface drainage in Blue Hills Parkway, Milton.

The following contracts for construction in the Parks Division were awarded during the year:

A section of the Circumferential Highway authorized by Chapter 334 of the Acts of 1929, from the terminus of Fellsway East to Lynn Fells Parkway, a distance of about 10,100 feet.

Memorial Drive underpass at the junction of Memorial Drive and Massachusetts Avenue, Cambridge.

Nonantum Road Extension, authorized by Chapter 371 of 1929, from its terminus at Maple Street, Newton to Water Street, Watertown.

Reconstruction of Alewife Brook Parkway from Mystic Valley Parkway, Somerville to Massachusetts Avenue, Cambridge, authorized by Chapter 450 of 1931.

Brook Road and Reedsdale Road from Blue Hills Parkway to Pleasant Street, Milton, as authorized by Chapter 420 of 1930, as amended by Chapter 450 of 1931, were reconstructed and resurfaced and turned back to the town of Milton for care and maintenance.

The northerly slope of the Bunker Hill Monument grounds was regraded to correspond with the southwesterly slope and a new flight of stone steps constructed.

The following resurfacing with some changes in alignment and grade were made during the year:

South Border Road, from the Medford-Winchester line to Mystic Valley Parkway with bituminous penetration macadam pavement.

Revere Beach Parkway between the Saugus Branch Bridge of the Boston and Maine Railroad and Main Street, Everett was widened seven feet and the Saugus Branch and Western Division bridges over the Boston and Maine Railroad were repaired and widened.

The roadway over the Charles River Dam was rebuilt with granite block paving on a cement concrete base and new concrete sidewalks constructed.

The southerly driveway of Memorial Drive from Longfellow Bridge to Harvard Bridge was resurfaced with sheet asphalt on a cement concrete base, and a concrete sidewalk built.

A short section of Charles River Road on the curve near the Harvard Stadium was banked and resurfaced.

Nonantum Road from Brook Road, Brighton to Charlesbank Road, Newton was widened to forty feet and resurfaced.

Certain sections of the Old Colony Parkway between Columbia Road and Quincy Shore Boulevard were brought to grade and resurfaced.

Chickatawbut Road from west of Randolph Avenue to near Sassamon Notch Road in the Blue Hills Reservation, Milton was regraded, realigned and resurfaced.

Furnace Brook Parkway from Adams Street to Quarry Street and from Miller Street to Willard Street, Quincy was resurfaced.

The old pavement and car tracks on Blue Hills Parkway at Mattapan were removed and asphalt pavement laid on the bridge. Portions of Blue Hills Parkway southerly from the bridge and near Brook Road were resurfaced.

A portion of Bold Knob Road, Stony Brook Reservation, was relocated and a contract for construction awarded late in the year.

IV. Parks and Reservations

The usual work of maintenance and upkeep of parks, reservations and boulevards has been continued during the year. To relieve the general unemployment situation \$230,000 was appropriated early in the year and about 700 men were employed during the first four months for cutting brush, clearing and other work, principally in the Middlesex Fells, Blue Hills and Charles River Upper Divisions, and substantial areas were improved.

One hundred and eighty band concerts were given during the summer months in the various parks and reservations at a cost of \$29,612.62. Twenty-three Symphony concerts were given on the Esplanade between July 9th and August 5th. Mr. Arthur Fiedler again directed the concerts, which were supported by public subscription without expense to the State other than the erection of the shell and police supervision. The popularity of these concerts was shown by the attendance which exceeded that in previous years.

The golf course at Riverside was well patronized, the attendance comparing favorably with the previous year in spite of the business depression. Approximately 50,000 rounds of golf were played upon the course during the season. On the southerly side of the Charles River across from the recreation grounds an additional nine holes were cleared and constructed and will be ready for use in the coming year, making an eighteen-hole course.

A special act passed during the year authorized the construction of an eighteen-hole golf course at the Redman Farm at Ponkapoag. Donald Ross was employed to lay out the course, the work was done by contract, nine holes were completed and seeded during the year and will be ready for use in the coming spring. Plans were prepared for a

locker building, a contract awarded for construction and the building will be completed early in the coming year.

A contract for an addition to the Police Station at Revere was awarded in the fall and will be completed early in the coming year. This addition will provide for a new emergency room, room for lost children, headquarters for the labor force, and a garage for the ambulance with access to the Reservation Road.

A new police signal system with recall lights was installed at Revere.

At Nahant a small building for a concession near the playground was erected and rented and two new tennis courts built.

At the urgent request of the town of Nahant, the residents of which objected to the public use of Short Beach, that portion of land south of Wilson Road previously transferred to the Commonwealth for care and control was transferred back to the Town of Nahant.

The section of Aberjona River south of the bridge as far as the Wedgemere station of the Boston and Maine Railroad was dredged and the area between Bacon Street, the railroad and the river was filled.

Further improvements were made at the Zoo at the headquarters at Spot Pond by the building of new quarters and cages. The Zoo at the end of the year contained a total of 458 animals and birds, most of which are native to this section of the country. Of this total 110 were raised and 50 donated during the year. Increasingly large numbers of persons visit the Zoo each year.

Considerable drainage work was done in different sections of the Middlesex Fells to eliminate mosquito breeding areas.

At the Charles River Lower Basin Division a new refreshment stand was built at Magazine Beach replacing the one destroyed by fire, the beach was resanded and extended about 100 feet, five new tennis courts with macasphalt top built on the area adjacent to Magazine Street. The marshy area between the Charles River and the Cambridge Cemetery has been ditched and drained. The area adjacent to Alewife Brook Parkway between the Boston and Maine Railroad and Massachusetts Avenue has been graded and loamed.

In connection with the opening of the underpass at Memorial Drive and Massachusetts Avenue the Commission took over the care and control of the westerly driveway of Memorial Drive between Longfellow Bridge and Harvard Bridge in accordance with the provisions of Chapter 371 of 1929. Both the easterly and westerly drives are now restricted to one way traffic and to pleasure vehicles.

Chapter 423 of 1931 turned over to the Commission care, control and maintenance of the River Street, Western Avenue and Larz Anderson bridges with the approaches thereto, including the intersections with Soldiers Field Road and Memorial Drive. The Commission has installed vehicular controlled traffic signals at these six intersections.

In the Charles River Upper Division the two new bath houses on the Charles River at Faneuil and at the Speedway were opened for the first time to the public.

Land near the Aetna Mills was drained, and a large section of marsh land along Soldiers Field Road was filled as a part of the mosquito control work.

A large part of the Hammond Woods was cleared of dead wood and undesirable growth by the emergency employees.

A new recreation building and shelter with a concession was built at the skating pond on Belcher Brook in the Blue Hills Reservation.

The playground at Spring Street was improved by the planting of a large number of willows and pines.

Several hundred feet of shore front northerly from Black's Creek along Quincy Shore Reservation was filled to protect the roadway and walk from accretion.

The grounds around the new bath house at Nantasket were graded, loamed and seeded.

V. Storm Damage and Shore Protection

The high tides and storms of March 4th and 5th caused extensive damage to the shore walls, roadways and other property in Winthrop, Revere, Lynn and Nahant. A special act was passed by the Legislature appropriating \$200,000 to repair the damage. A considerable portion of the money was required to remove sand, rocks and debris thrown up onto the shores and roadways, most of which was handled by the maintenance forces, with temporary and emergency labor assisted by steam shovels and other equipment.

The sea wall at Winthrop Shore Drive between Ocean Avenue and Underhill Street with a large portion of roadway was washed out and the fencing damaged. Sections of wall at Winthrop Highlands and opposite Broad Sound Avenue on the Winthrop Parkway were washed out.

These sections of wall have been rebuilt and strengthened in such a manner it is hoped they will withstand future storms for many years.

At Revere Beach opposite Oak Island a long section of the concrete steps and shore protection were undermined and damaged. A contract has been let to rebuild these steps and work was in progress at the end of the year.

At Woodbury's Point on the Lynn Shore a portion of the old stone rubble wall was washed out. This has been rebuilt with a concrete wall, carrying a second walk along the top of the lower wall around the point.

At Nahant considerable damage was done to the bulkheads and shore protection all of which has been repaired.

VI. Charles River Basin

Following a report made to the Legislature by the Commission that the estimated cost of the improvements in the Basin, as well as the authorized parkway projects, would exceed the funds provided, Chapter 371 of 1929 was amended segregating the cost of the improvements in the Basin from the parkway projects. The sum thus provided for the Basin improvements is \$1,400,000 plus any interest accumulations, made up of a gift of \$1,000,000 and an assessment on the City of Boston of \$400,000. The amendment further eliminated from the act the requirements that portions of the fill should be not less than the equivalent of areas of certain widths. The plans have been revised in accordance with the amendment, the areas of the fill have been reduced to the extent necessary to come within the funds available and certain formal features added to the plan. A contract for the filling was let in the latter part of the year.

VII. Police

The permanent police force has remained substantially the same during the year, the force at the end of the year consisting of one Captain and Executive Officer, 5 captains, 5 lieutenants, 1 lieutenant inspector, 1 detective sergeant, 17 sergeants, 160 patrolmen, 1 policewoman, a total of 191.

Edward M. Woods has continued as Captain and Executive Officer. Changes during the year have been as follows: 3 officers retired, 5 officers appointed. Twenty call officers and one extra policewoman were appointed for four months to take care of the extra work during the summer season.

During the year 4,180 complaints were handled by the department before the courts, resulting in 3,944 convictions. The men in the department performed 5,806 hours of extra duty without extra compensation. Nineteen members of the force were commended by the Commission for meritorious conduct.

VIII. Rainfall and Consumption of Water

The rainfall and yield of the watersheds was a little below the average during the year. Wachusett Reservoir at the beginning of the year was at elevation 354.81, 40.19 feet below high water, and dropped to 350 on February 13. The Ware River Works were put in operation in March and during the period from March 20 to June 15 12,813,600,000 gallons of water were diverted, and this together with the yield of the Wachusett watershed raised the level in the reservoir to 388.79 on June 22, the highest point reached during the year.

During the year 49,193,818,000 gallons of water were furnished to the eighteen municipalities regularly supplied, equivalent to an average daily consumption of 134,777,600 gallons or 95.8 gallons per capita for a population of 1,405,890 in the district supplied. This is a decrease from the previous year of over 1,500,000 gallons a day or 2.4 gallons per capita per day.

IX. Special Investigations

In accordance with the provisions of Chapter 22 of the resolves of 1930 the Metropolitan District Commission and the Department of Public Health examined the beds, shores and waters of the Mystic and Malden rivers and the marshes adjacent thereto so far as they are affected by the tides and considered methods whereby said rivers and marshes can best be improved for recreational or other purposes; also the matter of the construction of an overpass or underpass on Mystic Valley Parkway in Medford and the laying out and construction of a highway and a bridge over the Mystic River in Medford and reported on the same.

In accordance with the provisions of Chapter 15 of the Resolves of 1931 the Commission investigated and reported on the feasibility, expediency and cost of constructing a non-stop through way, connecting the Town of Nahant and the City of Lynn, over area heretofore occupied by the roadbed and tracks of the Nahant and Lynn Street Railway Company.

In accordance with the provisions of Chapter 18 of the Resolves of 1931 the Commission investigated and reported on a bill relative to the construction of a bridge, with suitable approaches, over the Charles River at Purgatory Cove, so called, in the City of Waltham.

In accordance with the provisions of Chapter 19 of the Resolves of 1931 the Commission investigated and reported on a bill relative to establishing a park on land adjacent to the Wachusett Dam in the town of Clinton.

In accordance with the provisions of Chapter 20 of the Resolves of 1931 the Metropolitan District Commission and the Department of Public Health investigated and reported relative to improving the condition of the Charles River in the cities of Waltham and Newton and the towns of Weston and Watertown.

In accordance with the provisions of Chapter 24 of the Resolves of 1931 the Commission investigated and reported on the advisability, expediency and cost of developing, improving and maintaining for recreational or park purposes, certain land now under its control in the cities of Chelsea and Revere.

In accordance with the provisions of Chapter 39 of the Resolves of 1931 the Commission investigated and reported on the feasibility and probable cost of the construction of a public golf course in or adjacent to the Middlesex Fells Reservation.

In accordance with the provisions of Chapter 40 of the Resolves of 1931 the Department of Public Health and the Metropolitan District Commission investigated and reported on the matter of increasing the capacity of the Charles River valley sewer of the South Metropolitan

Sewerage District and constructing such other works as may be necessary to adequately accommodate the sewage from the town of Watertown and other communities with the view to eliminating the overflow of sewage into the Charles River in or near said Watertown.

X. Other Reports

The reports of the Directors of Park Engineering, Water and Sewerage, with tables, statistics and financial statements, are hereto appended.

Respectfully submitted,

DAVIS B. KENISTON,
Metropolitan District Commissioner.

February 29, 1932.

REPORT OF THE DIRECTOR AND CHIEF ENGINEER OF PARK ENGINEERING

HON. DAVIS B. KENISTON, *Commissioner, Metropolitan District
Commission.*

DEAR SIR:

The following report is submitted of the work done under the direction and supervision of the engineering department of the parks division during the year ending December 31, 1931.

ORGANIZATION

The engineering force has averaged as follows: one director of park engineering, one associate civil engineer, one superintendent of locks and drawbridges, one supervisor of machinery and equipment, one senior civil engineer, five assistant civil engineers, thirteen junior civil engineers, one senior engineering draftsman, one inspector of construction, fifteen senior engineering aids, sixteen junior engineering aids, one foreman of garage and chauffeur, four stenographers, one plan clerk and forty-nine lock and drawbridge assistants, mechanics, operators and helpers.

All construction work and the general direction and supervision of all maintenance and repairs of parkways and boulevards, bridges, buildings and structures in the various park divisions and the operation of the various drawbridges and locks, are in charge of the engineering department.

CONSTRUCTION AND MAINTENANCE WORK

During the year plans and specifications have been prepared and construction supervised on the following work done by contract or by the maintenance forces of the various divisions:

CHARLES RIVER BASIN

Widening and extension of the Boston Embankment. Detailed estimates of this portion of the work as authorized by the legislature of 1929, indicated that the amount appropriated of \$1,400,000 was insufficient and a request for an additional appropriation was made by the Commission. The legislature authorized no additional funds but amended the act permitting a wider latitude in the width of the filling. The plans as adopted by the Commission provide for the widening of the Charlesbank park and playground (property of the city of Boston) between the dam and Longfellow Bridge to a maximum width of 300 feet. From the Longfellow Bridge to Otter Street the width of the filling is of varying distances from 125 feet to 250 feet, with a boat haven and breakwater provided near the present location of the Union Boat Club opposite Pinckney Street and Mount Vernon Street. From opposite Otter Street to the Charlesgate, west of Harvard Bridge, the filling is to be in general 115 feet in width. Between Exeter Street and Fairfield Street no widening of the present embankment is contemplated but a lagoon 1,000 feet in length is to be formed by the filling in of a dike at a distance of 240 feet from the present embankment wall. From the Charlesbank to Cottage Farm Bridge an embankment 155 feet in width will be constructed northerly from the present wall forming the northerly boundary of Back Street.

The present embankment is bounded by a granite wall along the shore of the basin. No wall is contemplated at the edge of the new filling as the filling will extend into the basin on gradual slopes and be surfaced with heavy gravel.

The stronger winds over the basin are from the northwest and owing to the width of the basin these winds frequently make the water quite rough and the waves rebound to a considerable distance from the present wall.

The treatment of the new shore line is expected to break up the waves and materially improve conditions for boating. The lagoon is expected to provide a place where small boats may be used and where skating may be enjoyed in the winter time. The latter sport is not now enjoyed as it is quite unusual that the basin itself is frozen sufficiently to be available for skating.

This widening of the Boston Embankment and its extension to near the Cottage Farm Bridge required the rebuilding and extension of the overflows from the Boston Marginal conduit at Fruit Street, Berkeley Street, Gloucester and Exeter Streets. Provision was made for an additional conduit at Fairfield Street to connect with a future overflow chamber on the marginal conduit. The filling also required the extension of large drains at Deerfield Street and Ashby Street, together with tributary local drainage in Back Street between the Charlesgate and Ashby Street and in the embankment opposite Embankment Road.

A considerable portion of the filling between the dam and Pinckney Street has been placed by various contractors from excavations made in various parts of the district. Between the Cottage Farm Bridge and Granby Street, the Boston Transit Department furnished a large quantity of filling without cost to the Commission from the subway excavation in Governor Square, Beacon Street and Commonwealth Avenue.

The Fruit Street overflow from the Boston Marginal conduit was constructed partly of reinforced concrete and partly of reinforced concrete culvert pipe laid on a pile foundation, the work being done under contract by the Bay State Dredging and Contracting Company.

Local surface drains in the embankment opposite Embankment Road were laid by contract with the M. McDonough Company.

A contract for the filling for the widening of the embankment, the construction of a breakwater opposite Pinckney Street and Mount Vernon Street, a breakwater forming a lagoon between Exeter Street and Fairfield Street, rebuilding of the overflows from the marginal conduit at Berkeley Street, Exeter Street and Gloucester Street, and a portion of a new overflow at Fairfield Street, extensions of the Deerfield and Ashby Street drains and local drainage in Back Street, was awarded to the Trimount Dredging Company. This work is now in progress and will be completed by the end of the summer season of 1932.

Memorial Drive Underpass. The Charles River Basin act authorized the construction of an underpass in Memorial Drive under Massachusetts Avenue at the northerly end of Harvard Bridge. The underpass has a total length of 640 feet from portal to portal with 4 per cent grades on each incline. Each roadway is 21 feet in width, paved with granite block pavement and the roadways are separated by double curbing 3 feet in width. Granite block pavement grouted with cement was used on account of its comparative freedom from being slippery under varying weather conditions. It is the type of pavement that was adopted for the Holland Vehicular Tunnel in New York, for other similar tunnels and it will be used in the East Boston tunnel. No provision is made for pedestrians to use the underpass as it is considered that this type of traffic is better accommodated on the surface.

As concrete is not a material that adequately endures permanent exposure to the weather, a material was sought which would be of a more lasting character for the walls of the underpass, the coping of the walls, and the fencing. For exposed structures granite has demonstrated its durability through the ages and after considerable investigation it was decided to use this kind of stone on all exposed surfaces. Consequently the walls were designed of reinforced concrete with a granite facing consisting of slabs 4 inches in thickness. These slabs were used as forms for one side of the concrete backing of the walls and are secured to the walls by the adhesion of the concrete as well as by anchors from the slabs into the concrete. These thin slabs are sawed from large blocks of granite by steel saws and the exposed sur-

faces sand blasted to remove saw marks. Many of the slabs are of large size, running up to $5\frac{1}{2}$ feet in width by 11 feet in height. The granite company gave careful attention to its product and was successful in cutting these slabs so that when they were set the walls exhibited an exceptionally smooth surface and were in perfect alignment. The result of this unique type of construction is that the underpass appears as though it was constructed of massive blocks of granite.

To aid visibility for traffic on the upper roadways and to conform with the treatment of the wall along the basin, a solid parapet or a stone balustrade on top of the walls was not favored and a fence was designed having large steel piping for its top and bottom rails, between which are vertical palings of steel rods. This fence has large granite posts at frequent intervals, lighting standards being placed on alternate posts. The fence is very heavy construction and to add to its strength a $\frac{3}{4}$ -inch steel cable was inserted inside the upper pipe throughout its length, anchored to the end stone posts of this fence and drawn taut by turn buckles. The coping on top of the walls is 12 inches in height and this height of coping combined with the sturdy fence is expected to successfully resist vehicles which may accidentally turn out of the roadways.

The underpass is lighted by sixteen 600 candle power street lights on standards on top of certain of the fence posts and the portion under Massachusetts Avenue is lighted by ten 300 candle power lamps. The lamps under the bridge portion are so arranged as to be turned on either in whole or in part during dark days as well as at night.

The lowest portion of the roadway under the Massachusetts Avenue bridge is about 4 feet below the level of the Charles River Basin, preventing direct drainage of rain water from the underpass roadways into the basin. Disposition of surface water was accomplished by constructing a pump room on the southerly side of the underpass just west of Massachusetts Avenue. This pump room is over a sump into which the rain water flows from catch basins at the lowest point of the roadways and is pumped into the basin by two automatic electrically driven submerged sewage pumps. One pump is operated by current from the Cambridge Electric Light Company and the other from current furnished by the Boston Elevated Railway, thus giving two independent sources of power supply. Each pump is designed to take care of the maximum rainfall which is likely to occur as estimated from records of many years past.

As the roadways of the underpass are below the level of the basin it was necessary to design the floor of the structure so as to carry both the weight of vehicles and the upward pressure of the ground water. Satisfactory foundation material was found at a depth of some $10\frac{1}{2}$ to $13\frac{1}{2}$ feet below the level of the basin and the side walls and roadway are supported for the most part by circular concrete piers carried down to this hard gravel base.

It is planned to operate the traffic on Memorial Drive and Massachusetts Avenue at this intersection in such a manner that all through traffic on Memorial Drive will use the underpass and that no traffic on the upper roadway of Memorial Drive will be allowed to cross Massachusetts Avenue. All upper level traffic on Memorial Drive will either turn to the right or left into Massachusetts Avenue or Harvard Bridge. The Massachusetts Avenue and Harvard Bridge traffic will either continue over these thoroughfares or will turn to the right or left into the appropriate driveways on Memorial Drive. A traffic count made in August 1930 indicated a passage through this intersection of 40,000 vehicles per 16 hour day from 7 a.m. to 11 p.m.

The contract for this underpass was awarded to Coleman Brothers, Inc. and the work nearly completed.

Arsenal Street to North Beacon Street. Tentative plans and esti-

mates have been made of the proposed parkway on the southerly side of the Charles River Basin between Arsenal Street and North Beacon Street in the Brighton district of Boston, through and adjacent to the property of the Butchers' Slaughtering and Melting Association.

Nonantum Road Extension. Plans and specifications for the construction of this parkway from near Hyde Brook, Newton, to Water Street, Watertown, were prepared and the construction contract awarded to Mr. Thomas Joseph McCue. The roadway was completed and opened to traffic, but the entire work was not finished.

CIRCUMFERENTIAL HIGHWAY

Another of the major links in the Circumferential Highway, authorized by chapter 334 of the acts of 1929, was completed by the construction of Fellsway East Extension from the northerly terminus of Fellsway East through the Middlesex Fells Reservation and over Emerson Border Road to the southerly end of Lynn Fells Parkway at the Stoneham-Melrose line, a distance of about two miles, under contract with C. M. Callahan, Inc.

The greater part of this route is through a picturesque section of the Fells hitherto only traversed by a narrow carriage road. The completion of this parkway forms a direct through route from the Fellsway via Lynn Fells Parkway to the Newburyport Turnpike and should prove an attractive and direct route for through traffic. This location for this section of the circumferential highway was chosen by the Commission after careful consideration and studies and surveys had been made of the alternate route via Woodland Road through the Fells.

In connection with and as a part of this work, the westerly roadway of Fellsway East was resurfaced from East Border Road to Highland Avenue in Malden.

RESURFACING OF PARKWAYS AND BOULEVARDS

The southerly roadway of Memorial Drive from Massachusetts Avenue to the Longfellow Bridge was resurfaced with a sheet asphalt pavement on a 6-inch cement concrete base. Drainage improvements were made in connection with this work by carrying the drain outlets through the basin wall. These outlets had previously terminated under the sidewalk back of the face of this wall, with the result that the outlets were blocked up in many cases and did not properly function. The planting space between the roadway and the basin wall was resurfaced with loam and seeded and a cement concrete sidewalk laid adjacent to the basin wall. The contractor for this work was the John McCourt Company.

The old granite block pavement on the Charles River Dam in Boston and Cambridge was removed, the old concrete base was repaired and rebuilt and a new granite block pavement laid. This form of pavement was adopted as a major proportion of the traffic over the dam consists of heavy trucking. The discontinued double track line of the Boston Elevated Railway was removed, together with the poles for support of the trolley wires. The old brick sidewalks were renewed with cement concrete walks.

South Border Road, Winchester, northerly from near the Medford-Winchester line to Mystic Valley Parkway, was regraded, the roadway widened, the alignment rectified and a bituminous penetration macadam pavement laid with necessary drainage. The contractor on this work was the M. McDonough Company.

The roadway of Furnace Brook Parkway from Adams Street to Quarry Street and from Miller Street to Willard Street in Quincy, was resurfaced with bituminous penetration pavement and granite block edging installed on either side of the roadway. This work was done by A. DeStefano, contractor.

Chickatawbut Road, formerly Administration Road, from west of Randolph Avenue to near Sassamon Notch Road in the Blue Hills Reservation, Milton, was regraded, alignment rectified, incidental drainage improvements made and a new bituminous penetration pavement laid by the University Contracting Company, contractors.

The Water Division laid a 60-inch water main in Nonantum Road along its southerly side from Charlesbank Road to Brook Road in Newton and in the Brighton district of Boston. In connection with this work the parkway was widened from 36 feet to 40 feet and the whole road resurfaced. A portion of the cost of resurfacing was paid from the resurfacing account of the Parks Division and the balance by the Water Division as part of the cost of laying of the water main. The contractor for this work was the C. & R. Construction Company.

Certain sections of the Old Colony Parkway between Columbia Road and the Quincy Shore Boulevard in the Dorchester section of Boston and in Quincy were brought up to grade and resurfaced with bituminous penetration pavement by the M. McDonough Company, contractors.

Revere Beach Parkway between the Saugus Branch Bridge and Main Street, Everett, was widened seven feet on the southerly side to conform to the widening of the bridge over the Saugus Branch of the Boston and Maine Railroad. This parkway was also widened on its southerly side on each side of the bridge over the Western Division of the Boston and Maine Railroad, in connection with the widening of that bridge. This work was done by the M. McDonough Company.

Plans and specifications were prepared for the relocation of a portion of Bold Knob Road in the Stony Brook Reservation, about 1700 feet in length, and a contract for its construction awarded to J. Susi and Brother. This work is in progress.

The completion of the gravel surface on the northerly roadway of Mystic Valley Parkway from Harvard Avenue to Jerome Street was completed by the forces of the Middlesex Fells Division.

On Soldiers Field Road, in the Brighton district of Boston, the roadway around a curve north of the Harvard Stadium was crowned when originally built and is of such short radius that it has been a source of danger to motor vehicle travel. The outer half of this roadway around the curve was reconstructed and resurfaced so that the roadway is now a banked section for its full width. This work was done by the forces of the Charles River Upper Division.

The old pavement and car tracks on the bridge on Blue Hills Parkway at Mattapan over the Neponset River were removed and an asphalt pavement laid on this bridge. A portion of Blue Hills Parkway northerly from this bridge was also repaved and a portion of the central reservation reconstructed as a roadway to improve traffic conditions. This work was done by the John P. Condon Corporation, contractors.

Of the contracts let during 1930 on which work had been in progress during that year, six were not completed until various dates in 1931, as follows:

Construction of portion of Quincy Shore Boulevard, formerly known as Pilgrim Boulevard, Quincy.

Drainage improvements in Malden, Everett and Revere, authorized by Chapter 456 of the Acts of 1924.

Construction of Forest and Main Streets, now known as Fellsway West, Medford and Stoneham, Middlesex Fells Reservation.

Resurfacing South Border Road, Medford and Winchester, Middlesex Fells Reservation.

Construction of traffic circle at the junction of Middlesex Fells Parkway and Revere Beach Parkway, Medford.

Surface drainage in Blue Hills Parkway, Milton, in conjunction with the town of Milton.

ALEWIFE BROOK PARKWAY

By chapter 450 of the acts of 1931, the Commission was authorized to relocate, widen and reconstruct Alewife Brook Parkway from Massachusetts Avenue in the city of Cambridge, to Mystic Valley Parkway in the city of Somerville and an appropriation of \$100,000 was made therefor. The roadway of a portion of this parkway was of insufficient width for four-lane traffic and the pavement had been in bad condition for a considerable period. The roadway was widened to 40 feet throughout, including some rectification in alignment, and resurfaced with an asphalt pavement carrying a five year guarantee. The contractor was Simpson Bros. Corporation.

REEDSDALE ROAD AND BROOK ROAD, MILTON

By chapter 450 of the acts of 1931, the legislature authorized the Commission to resurface Reedsdale Road and Brook Road from Pleasant Street to Blue Hills Parkway and allocated for the work the balance of the money appropriated by the preceding legislature by chapter 420 for the taking of land for an extension of Furnace Brook Parkway in Quincy and Milton. After conferences with the authorities of the town of Milton it was decided that the central reservation in these roads be removed and that the resurfacing should take the form of a bituminous penetration pavement 40 feet in width in the centre of these highways. A contract for this work was awarded to Coleman Brothers, Inc., and on the completion of the work these streets were turned over by the Commission to become town ways of the town of Milton.

PONKAPOAG GOLF COURSE

The legislature of 1931, by chapter 416, appropriated \$80,000 for the construction of an 18 hole golf course, including locker and service buildings in that section of the Blue Hills Reservation known as the Redman Farm in Canton. A contour plan was made of that portion of the Blue Hills Reservation in Canton, West of Ponkapoag Pond, and an 18 hole golf course was designed by Donald Ross. A contract for the construction of this golf course was entered into with the C. & R. Construction Company and the work is now in progress.

A contract for a locker building and a professional building, designed by J. D. Leland & Company, was awarded to Corsetti and Arcese, builders, these buildings being located on the westerly side of the golf course near the Stoughton Turnpike in Canton. These structures will be completed in the early springtime.

REPAIRS TO SHORE PROTECTION

The high tides of March 4 and 5, 1931, caused extensive damage to the shore walls, roadways and other property of the Commission in Winthrop, Revere, Lynn and Nahant, and the legislature by chapter 189 of the acts of 1931 appropriated \$200,000 for repairing the damage.

A portion of this money was expended clearing up the gravel, sand and debris thrown up on the Winthrop Parkway, Winthrop Shore Reservation, Revere Beach Parkway, Revere Beach Reservation and Nahant Beach Parkway. Other work done under this appropriation was as follows:

The sea wall at Winthrop Shore Drive was washed out between Ocean Avenue and Underhill Street, together with a large portion of the roadway, and the fencing along this reservation was badly damaged. The wall was rebuilt, the roadway filled in where it had been washed out, new pavement laid and the fence repaired, under contract with the M. McDonough Company.

At Winthrop Highlands a section of the old wall was washed out and this was repaired and rebuilt by a new concrete wall and coping reset on a portion of the old stone wall under contract with the M. McDonough Company.

At Winthrop Parkway opposite Broad Sound Avenue, Revere, a section of the concrete wall was washed out together with a portion of the roadway. This wall was rebuilt and extended to the northward and the roadway repaired and resurfaced by M. McDonough Company.

On the Revere Beach Reservation, opposite Oak Island, the reinforced cement concrete steps forming the sloping shore protection in this location was badly damaged and a contract for repairing this work was awarded to the M. McDonough Company. This work was in progress at the close of the year.

On the Lynn Shore Reservation, at what is known as Woodbury's Point opposite Atlantic Terrace, a large section of the old stone rubble wall was washed out. This wall was rebuilt with a cement concrete wall of similar design to that on other portions of the reservation. This work was done under contract by Simpson Bros. Corporation.

BUNKER HILL MONUMENT

The budget appropriation for 1931 provided the sum of \$10,000 for grading and new steps on the northeasterly side of Bunker Hill Monument. The design for the new granite steps called for a wider and longer flight and the steepness of the slope of the embankment was materially reduced. This work was done under contract by M. McDonough Company and completed except for the seeding of the embankment.

BRIDGES

The floor systems and pavements of the bridges on the Revere Beach Parkway in Medford and Everett over the Western Division and over the Saugus Branch of the Boston & Maine Railroad required an entire renewal. As the roadways on these bridges were of insufficient width for four lanes of traffic, the opportunity was utilized to widen these bridges on their southerly sides. This required the extensions of the piers and abutments, the moving of the southerly girders to the southward and extending the steel floor beams. A new wooden floor was constructed on each bridge of creosoted timber and with roadway pavements of granite blocks with asphaltic filler. On both bridges the steel work was done by the Boston Bridge Works and the flooring and pavement by John J. Collins, contractor.

A new floor system with asphalt plank roadway surface was placed on the Aberjona River Bridge in the Mystic Valley Parkway at Winchester.

On Fellsway West a new floor system with asphalt plank pavement was constructed on the westerly half of the bridge over the Medford Branch of the Boston & Maine Railroad.

On the Old Colony Parkway the steel work was painted on the Mount Vernon Street Bridge.

The northerly portion of Wellington Bridge consists of reinforced concrete girders and a concrete floor slab with granite block pavement. The reinforced concrete girders on the two northerly bays had disintegrated in numerous places, exposing the steel reinforcement. These girders were repaired by gunite applied by the National Gunite Contracting Company. Various repairs were made to the wooden floor system and roadway pavement of this bridge.

The steel work of the bridge carrying the New York, New Haven & Hartford Railroad over the Old Colony Parkway at Pope's Hill was painted.

The steel work of the bridge carrying the New York, New Haven & Hartford Railroad tracks over Furnace Brook Parkway near Hancock Street, Quincy, was painted.

The floor, curbing and fencing of the Saugus River Bridge in Revere and Lynn were repaired.

A new wearing surface was laid on the southerly half of the draw span of the Charles River Dam.

Contracts were let for the reconstruction of the superstructure of the Revere Beach Parkway bridge over the Boston, Revere Beach and Lynn Railroad near Eliot Circle in Revere. The contract for the steel work was awarded to the Boston Bridge Works and the reinforced concrete floor slab, asphalt pavement and fencing to M. McDonough Company. These awards were made late in the autumn and the work has not been commenced.

BUILDINGS

The legislature appropriated \$40,000 for additions to the police headquarters at Revere Beach Reservation. Plans and specifications were prepared by Putnam and Cox, architects, and the contract for this work awarded to Allan A. Gillis Construction Company. This work is now in progress and will be completed in the early spring.

A contract was made with the Columbia Cornice Company for renewing the roof on the Nantasket Police Station, police dormitory and the roof of the piazza around the hotel Nantasket.

A skating shelter, designed by Putnam and Cox, architects, was constructed near the skating pond in the Blue Hills Reservation west of Willard Street, Quincy, by Carl S. Helrich, contractor:

DRAINAGE

At the time Revere Beach Parkway was constructed between Winthrop Avenue and Eliot Circle, Revere, a double 24-inch vitrified pipe drain was laid in the old location of a creek, under the new boulevard, south of the Revere Beach and Lynn Railroad. This pipe failed and did not properly convey the surface drainage tributary to it from a portion of the Beachmont section of Revere. A new cement concrete drain, 42-inches in diameter, was laid near the location of the old pipes under contract with Cenedella and Company.

The surface water drain south of the steamboat pier near the Nantasket Beach police station was rebuilt and extended by the use of cast iron pipe by C. M. Callahan, Inc., contractor.

MISCELLANEOUS

A portion of the Aberjona River between Bacon Street and the Boston and Maine Railroad in Winchester was very shallow and at times of low water in Upper Mystic Lake the mud flats were exposed. This shallow area was dredged and material deposited on the adjacent land of the Commonwealth by contract with George M. Byrne. This work resulted in a material improvement in this section of the river.

A nine hole extension of the Riverside Golf Course on either side of Grove Street, Newton, has been constructed by the forces of the Charles River Upper Division and the necessary water mains and services installed.

At the main lock at the Charles River Dam numerous cracks and disintegrated portions on the lock walls were repaired by gunite and the top corners of the walls chamfered. This work was done under contract by the National Gunite Contracting Company.

Six tennis courts, surfaced with asphalt, on the northerly side of Memorial Drive, Cambridge, east of Magazine Street, were constructed and two tennis courts on the westerly side of the Nahant bath house were built of similar material. The courts at both locations were enclosed with woven wire fencing of the cyclone type.

Granite edgestone, cement concrete walks and incidental work was done on the northerly side of Lynn Fells Parkway between Green Street and Bellevue Avenue, Melrose.

Cement concrete walks were constructed on the westerly side of West Roxbury Parkway between Beech Street and Centre Street, West Roxbury.

The fence along the basin wall on Memorial Drive from the Longfellow Bridge to westerly of the Harvard Bridge was repaired.

Cement concrete walks at various locations on the Revere Beach Reservation were relaid and extended by C. W. Doloff and Company, contractors.

A new map of the Blue Hills Reservation has been prepared and printed for distribution to the public at a nominal cost.

PLANS, STUDIES AND ESTIMATES

Surveys, plans, studies and estimates have been made as follows:

Preliminary surveys for the extension of Revere Beach Parkway from Fellsway, Medford, to Mystic Avenue, Somerville, authorized by chapter 450 of the acts of the legislature of 1931.

Plans for land takings and detailed surveys and plans have been made for the construction of Hammond Pond Parkway from Hammond and Newton Streets to Beacon Street, Newton, for which authorization and appropriation was made by chapter 450 of the acts of 1931.

Surveys have been made for the extension of Lynn Fells Parkway from Newburyport Turnpike to Walnut Street, Saugus, as authorized by chapter 420 of the acts of 1930.

Plans and estimates have been made in response to chapter 15 of the resolves of 1931 relative to a through way from Lynn to Nahant.

PLANS FOR TAKINGS

Plans for takings have been made as follows:

Takings of land in Somerville on the northerly side of Shore Drive from Middlesex Fells Parkway at Wellington Bridge to west of Putnam Street along the Mystic River.

Taking of land in Melrose for Fellsway East Extension from Stoneham-Melrose line along Washington Street for a distance of about 500 feet.

Taking of land in Melrose for Fellsway East Extension, from Aaron Street to Washington Street.

Taking of land in Stoneham for Fellsway East Extension, from Wyoming Avenue to Ravine Road.

Exchange of lands in Stoneham for Fellsway East Extension, from Wyoming Avenue to Lynn Fells Parkway.

Taking of land known as Moswetusetts Hummock at Squantum Street in Quincy.

Plan of conveyance of land in Quincy to the Granite City Ice Company on Furnace Brook Parkway at the northwesterly corner of Adams Street.

Taking of land in Medford on Mystic Valley Parkway at the southeasterly corner of Ravine Road.

Plan of conveyance of land to Harold I. and Hazel G. Peabody on the northerly side of Lynn Fells Parkway easterly from Albert Road, Melrose.

Plan of conveyance of land to the Trustees of Boston University on the southerly side of Soldiers Field Road westerly from Chilmark Street, Boston.

Plan of conveyance of land to the Town of Winchester on the easterly side of Mystic Valley Parkway, easterly from Manchester Road, Winchester.

Plan of lands from Wilson Road to Kennedy Court on Nahant Beach Parkway to be transferred to the Town of Nahant for care and control.

Taking of land in Milton at the northeasterly corner of Randolph Avenue and Chickatawbut Road, Blue Hills Reservation.

Taking of land in Somerville for reconstruction of Alewife Brook Parkway, from Woods Avenue to Gordon Street.

Taking of land at Back Street, Boston, from Granby Street to Raleigh Street, Charles River Basin.

Taking of land in Charles River Basin, Boston, from Granby Street to Charlesgate West.

Plan of land at the northeasterly corner of Charles River Dam and Nashua Street, Boston, to be transferred to the City of Boston for care and control.

Taking of land in Newton and Watertown along the Charles River Basin for extension of Nonantum Road from Hyde Brook, Newton, to north of Water Street, Watertown.

LIGHTING OF PARKWAYS AND BOULEVARDS

New parkway lighting installations have been completed and contracts for the operation thereof have been made for the roadway of the Charles River Dam, Winthrop Shore Reservation and New South Street, Stoneham. The lighting of the Anderson, Western Avenue and River Street Bridges has been taken over from the Boston and Cambridge Bridge Commission.

TRAFFIC CONTROL SIGNALS

Contracts for the installation and operation of traffic signals have been made for the following intersections and the installation commenced:

Soldiers Field Road at the Anderson, Western Avenue and River Street Bridges

Memorial Drive at the Anderson, Western Avenue and River Street Bridges

These traffic control signals are of the automatic vehicle operated type and will be installed and maintained by the Automatic Signal Corporation. The contract provides for the Commission to pay for the installation of the equipment, which is to be maintained on a monthly rental basis by the Signal Company. These signals provide for the customary control of vehicles by green, yellow and red lights, as approved by the state department of Public Works, with a pedestrian interval operated by push buttons at each corner of the intersecting streets.

PERMITS

Three hundred and thirty-five permits were issued for driveway entrances and miscellaneous purposes and one hundred and twenty orders concerning restrictions were issued and reported upon. This division has furnished the supervision of all driveway construction work and all other work relating to permits and has reported on building operations where violations of restrictions might be involved.

ICE BREAKING IN BASIN

The work of breaking ice in the channels of the Charles River Basin below Longfellow Bridge and in Broad and Lechmere Canals for the season of 1930 and 1931 was done by William J. Corkum by contract for the sum of \$4,500.

FINANCIAL

The cost of engineering salaries and expenses was as follows:			
Construction:			
Salaries	.	.	\$75,202.06
Expenses	.	.	3,949.66
			<hr/>
			\$79,151.72
Maintenance:			
Salaries	.	.	\$62,174.49
Expenses	.	.	6,016.02
			<hr/>
			68,190.51
			<hr/>
Total	.	.	\$147,342.23

Tables 1 to 9, inclusive, of statistics relating to the parks division are appended.

Respectfully submitted,
E. H. ROGERS,
Director of Park Engineering.

TABLE 1 — The following is a record of the traffic through locks and drawbridges during the year:

Charles River Dam Lock and Drawbridge

Number of openings of highway drawbridge	2,247
Number of openings of lock	3,702
Number of vessels	4,187
Number of boats and rafts	2,585
Lumber (feet B.M.)	542,600
Coal (tons)	228,888
Oil (bbls.)	593,200
Oil (gals.)	300,000
Piling (pieces)	685
Sand (tons)	273,605
Gravel (tons)	107,030
Granite (tons)	3,288
Miscellaneous (tons)	350

Cradock Bridge Lock

Number of openings	426
Number of boats	445
Number of boats over rollway	321

Neponset River Drawbridge

Number of openings	281
Number of vessels	357
Coal (tons)	40,206
Lumber (feet B.M.)	795,000

Dorchester Bay Drawbridge

Number of openings	445
Number of vessels	676
Oil (bbls.)	401,100
Sand (tons)	4,680
Piles (number)	350

Malden River Drawbridge

Number of openings	119
Number of vessels	181

Saugus River Drawbridge

Number of openings	286
Number of vessels	449

Wellington Drawbridge

Number of openings	53
Number of vessels	73

TABLE 3.—Metropolitan Park System—Mileage of Roadways—December 1, 1931

		Alewife Brook Parkway	Blue Hills Parkway		Blue Hills Res.	Charles River Res.		Dedham Parkway	East Milton Street		Fresh Pond Parkway	Furnace Brook Parkway	Lynn Fells Parkway	Lynn Shore Res.	Lynnway	Memorial Drive		Middlesex Fells Parkway		Middlesex Fells Res.		Mystic Valley Parkway	Nahant Beach Parkway	Nantasket Beach Res.	Neponset River Parkway	Old Colony Boulevard	Quannapowitt Parkway	Quincy Shore Res.	Revere Beach Parkway		Revere Beach Res.	Stony Brook Res.	West Roxbury Parkway	Winthrop Parkway	Winthrop Shore Res.	Woburn Parkway	TOTAL MILES		Grand Total Miles					
			Main	Second		Main	Second		Main	Second						Main	Second	Main	Second	Main	Second								Main Roadway	Second Roadway														
Cities																																												
1	Boston	-	.02	-	-	4.30	.21	.49	.48	.19	-	-	-	-	-	-	-	-	-	-	-	-	-	.52	2.85	-	-	-	-	3.57	2.07	-	-	-	-	-	-	14.30	.40	14.70	1			
2	Cambridge	1.31	-	-	-	-	-	-	-	-	.52	-	-	-	-	4.03	.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.86	.43	6.29	2					
3	Chelsea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.81	.33	-	-	-	-	-	-	.81	.33	1.14	3					
4	Everett	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.66	.66	-	-	-	-	-	-	1.66	.66	2.32	4					
5	Lynn	-	-	-	-	-	-	-	-	-	-	-	-	1.04	.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.16	-	1.16	5					
6	Malden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.87	1.12	.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.59	1.12	3.71	6					
7	Medford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.80	2.61	3.94	.40	3.19	-	-	-	-	-	.47	-	-	-	-	-	-	-	10.40	3.01	13.41	7					
8	Melrose	-	-	-	-	-	-	-	-	-	-	-	1.90	-	-	-	-	-	-	1.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.94	-	2.94	8				
9	Newton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.67	-	2.67	9						
10	Quincy	-	-	-	4.55	-	-	-	-	-	-	3.37	-	-	-	-	-	-	-	-	-	-	-	-	.31	-	2.44	-	-	-	-	-	-	-	-	10.67	-	10.67	10					
11	Revere	-	-	-	-	-	-	-	-	-	-	-	-	-	.57	-	-	-	-	-	-	-	-	-	-	-	-	2.19	1.13	2.70	-	.89	-	-	-	6.35	1.13	7.48	11					
12	Somerville	.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.48	.54	-	-	.38	-	-	-	-	-	-	-	-	-	-	-	-	-	1.79	.54	2.33	12					
13	Waltham	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13					
14	Woburn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.31	-	1.31	-	1.31	-	1.31	14				
Towns																																												
15	Arlington	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.46	-	1.46	-	1.46	15			
16	Belmont	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.33	-	.33	-	.33	16			
17	Braintree	-	-	-	.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.28	-	1.28	-	1.28	17			
18	Brockline	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18			
19	Canton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19			
20	Dedham	-	-	-	-	-	-	.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.49	-	.49	-	.49	20				
21	Dover	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21			
22	Hingham	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22			
23	Hull	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.71	-	-	-	-	-	-	-	-	-	-	-	-	.71	-	.71	-	.71	23			
24	Milton	-	2.82	1.46	5.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.61	1.46	10.07	-	10.07	24			
25	Nahant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.94	-	.53	-	-	-	-	-	-	-	-	-	-	-	-	1.94	-	1.94	-	1.94	25		
26	Needham	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26		
27	Saugus	-	-	-	-	-	-	-	-	-	-	1.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.71	-	1.71	-	1.71	27		
28	Stoneham	-	-	-	-	-	-	-	-	-	-	.02	-	-	-	-	-	-	-	6.67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.69	-	6.69	-	6.69	28		
29	Swampscott	-	-	-	-	-	-	-	-	-	-	-	-	.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.08	-	.08	-	.08	29			
30	Wakefield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.68	-	-	-	-	-	-	-	-	.68	-	.68	-	.68	-	.68	30		
31	Watertown	-	-	-	-	1.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.74	-	1.74	-	1.74	-	1.74	31		
32	Wellesley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32		
33	Weston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	33		
34	Westwood	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	
35	Weymouth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	
36	Winchester	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.57	-	1.81	-	-	-	-	-	-	-	-	-	-	-	-	.07	2.45	-	2.45	-	2.45	-	2.45	36	
37	Winthrop	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.27	-	1.27	-	1.27	-	1.27	-	1.27	37
		2.24	2.84	1.46	10.14	8.71	.21	.98	.48	.19	.52	3.37	3.63	1.12	.69	4.03	.43	5.15	4.27	12.94	.40	6.84	1.94	.71	1.05	3.16	.68	2.44	5.13	2.12	2.70	3.57	3.35	1.09	1.07	1.38	91.95	9.08	101.03					

TABLE 2—Metropolitan Park System—Areas of Reservations and Parkways—December 1, 1931

		RESERVATIONS (ACRES).															PARKWAYS (ACRES).															Grand Total Reservations and Parkways (Acres).									
		Beaver Brook.	Blue Hills.	Bunker Hill.	Charles River.	Hart's Hill.	Hemlock Gorge.	King's Beach and Lynn Shore.	Middlesex Fells.	Mystic River.	Nantasket Beach.	Neponset River.	Quincy Shore.	Revere Beach.	Stony Brook.	Winthrop Shore.	Total Acres.	Alewite Brook.	Blue Hills.	Dedham.	Fresh Pond.	Furnace Brook.	Hammond Pond.	Lynn Fells.	Lynnway.	Middlesex Fells.	Mystic Valley.	Nahant Beach.	Neponset River.	Old Colony.	Quannapowitt.			Revere Beach.	West Roxbury.	Winthrop.	Woburn.	Total Acres.			
	Cities.																																								
1	Boston, . . .	-	-	6.05	198.39	-	-	-	-	-	145.90	-	-	-	463.72	-	814.06	-	.27	21.98	-	-	-	-	-	-	-	28.80*	50.75	-	-	-	-	-	-	177.45	991.51	1			
2	Cambridge, . .	-	-	-	223.74	-	-	-	-	-	-	-	-	-	-	-	223.74	86.21	-	-	12.40	-	-	-	-	-	-	-	-	-	-	-	21.16	-	-	98.61	322.35	2			
3	Chelsea, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.16	21.16	3			
4	Everett, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.14	31.14	4			
5	Lynn, . . .	-	-	-	-	-	-	19.59	-	-	-	-	-	-	-	-	19.59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.32	19.91	5		
6	Malden, . . .	-	-	-	-	-	-	-	59.53	-	-	-	-	-	-	-	59.53	-	-	-	-	-	-	-	-	23.58	-	.32	-	-	-	-	-	-	-	-	23.58	83.11	6		
7	Medford, . . .	-	-	-	-	-	-	-	950.71	42.32	-	-	-	-	-	-	993.03	-	-	-	-	-	-	-	-	44.56	265.34	-	-	-	-	8.10	-	-	-	318.00	1,311.03	7			
8	Melrose, . . .	-	-	-	-	-	-	-	180.19	-	-	-	-	-	-	-	180.19	-	-	-	-	-	-	14.33	-	-	-	-	-	-	-	-	-	-	-	-	14.38	194.57	8		
9	Newton, . . .	-	-	-	187.64	-	4.24	-	-	-	-	-	-	-	-	-	191.88	-	-	-	-	117.17	-	-	-	-	-	-	-	-	-	-	-	-	-	117.17	309.05	9			
10	Quincy, . . .	-	2,562.57	-	-	-	-	-	-	-	-	-	40.75	-	-	-	2,603.32	-	-	-	-	101.13	-	-	-	-	-	-	-	2.72	-	-	-	-	-	103.85	2,707.17	10			
11	Revere, . . .	-	-	-	-	-	-	-	-	-	-	-	-	64.29	-	-	64.29	-	-	-	-	-	-	-	5.15	-	-	-	-	-	67.21	-	8.61	-	80.97	145.26	11				
12	Somerville, . .	-	-	-	-	-	-	-	-	5.92	-	-	-	-	-	-	5.92	10.00	-	-	-	-	-	-	-	11.83	4.95	-	-	-	-	-	-	-	26.78	32.70	12				
13	Waltham, . . .	42.77	-	-	38.65	-	-	-	-	-	-	-	-	-	-	-	81.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81.42	81.42	13		
14	Woburn, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.64	22.64	22.64	22.64	14				
	Towns.																																								
15	Arlington, . . .	-	-	-	-	-	-	-	-	7.83	-	-	-	-	-	-	7.83	28.10	-	-	-	-	-	-	-	-	17.40	-	-	-	-	-	-	-	-	45.50	53.33	15			
16	Belmont, . . .	15.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.56	20.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.43	35.99	16			
17	Braintree, . . .	-	67.84	-	-	-	-	-	-	-	-	-	-	-	-	-	67.84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.84	67.84	17	
18	Brookline, . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87.11	87.11	18		
19	Canton, . . .	-	471.34	-	-	-	-	-	-	-	-	264.26	-	-	-	-	735.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	735.60	735.60	19	
20	Dedham, . . .	-	-	-	6.51	-	-	-	-	-	-	234.54	-	-	-	-	241.05	-	-	15.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.16	256.21	20		
21	Dover, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21		
22	Hingham, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22		
23	Hull, . . .	-	-	-	-	-	-	-	-	-	25.59	-	-	-	-	-	25.59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25.59	25.59	23	
24	Milton, . . .	-	1,551.40	-	-	-	-	-	-	-	-	269.09	-	-	-	-	1,820.49	-	83.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	131.47	1,954.96	24			
25	Nahant, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66.22	51.16	-	-	-	-	-	-	66.22	66.22	25				
26	Needham, . . .	-	-	-	-	-	14.24	-	-	-	-	-	-	-	-	-	14.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.24	14.24	26	
	(Randolph), . .	-	257.00	-	-	-	-	-	-	-	-	-	-	-	-	-	257.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	257.00	257.00	27
27	Saugus, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.89	-	-	-	-	-	-	-	-	-	-	-	-	-	15.89	15.89	27		
28	Stoneham, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.15	705.48	705.48	28		
29	Swampscott, . .	-	-	-	-	-	-	705.33	-	-	-	-	-	-	-	-	705.33	-	-	-	-	-	-	.15	-	-	-	-	-	-	-	-	-	-	-	-	-	3.10	3.10	29	
30	Wakefield, . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.97	22.97	30	
31	Watertown, . .	-	-	-	80.95	-	-	-	-	-	-	-	-	-	-	-	80.95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80.95	80.95	31	
32	Wellesley, . . .	-	-	-	66.07	-	4.58	-	-	-	-	-	-	-	-	-	70.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70.65	70.65	32
33	Weston, . . .	-	-	-	139.82	-	-	-	-	-	-	-	-	-	-	-	139.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	139.82	139.82	33
34	Westwood, . . .	-	-	-	-	-	-	-	-	-	-	6.57	-	-	-	-	6.57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.57	6.57	34
35	Weymouth, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	
36	Winchester, . .	-	-	-	-	-	-	-	261.93	-	-	-	-	-	-	-	261.93	-	-	-	-	-	-	-	-	-	48.28	-	-	-	-	-	-	.60	48.88	310.81	36	36			
37	Winthrop, . . .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.83	16.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.13	-	.13	16.96	16.96	37			
		58.33	4,910.15	6.05	941.77	22.97	23.06	22.69	2,157.69	56.07	25.59	920.36	40.75	64.29	463.72	16.83	9,730.32	144.74	33.58	37.14	12.40	101.13	190.62	30.42	5.15	79.97	335.97	66.54	79.96	53.47	15.54	127.61	89.31	8.74	23.24	1,485.53	11,215.85				

* Includes East Milton St. from Wolcott Square to Paul's Bridge.

TABLE 4 — *Lengths of Roads and Bridle Paths in Reservations not open to Motor Vehicles*

	Miles
Blue Hills Reservation	42.08
Middlesex Fells Reservation	15.30
Stony Brook Reservation	1.60
Beaver Brook Reservation . . . . .	.22
Charles River Reservation . . . . .	.89
	<hr/> 60.09

TABLE 5 — *Electric Street Lights on Parkways and Reservations*

	Lights
Alewife Brook Parkway (25-600 c.p., 1-1500 c.p.)	26
Blue Hills Parkway (600 c.p.)	59
Blue Hills Reservation, Hillside Street (80 c.p.)	14
Charles River Dam, Reservation (1500 c.p.)	12
Charles River Dam, Roadway (600 c.p.)	20
Charles River Reservation, Embankment (87-100 c.p., 17-600 c.p.)	104
Charles River Reservation, No. Beacon Street Bridge (4-1500 c.p., 9-1000 c.p.)	13
Charles River Reservation, Soldiers Field Road (51-1000 c.p., 47-1500 c.p.)	98
Dorchester Bay Bridge (1500 c.p.)	8
Fresh Pond Parkway (100 c.p.)	15
Furnace Brook Parkway (600 c.p.)	56 ¹
Harvard Bridge (600 c.p.)	24
Larz Anderson Bridge (100 c.p.)	24
Lynn Fells Parkway 600 c.p.)	28 ²
Lynn Shore Reservation (6-1500 c.p., 24-1000 c.p.)	30
Lynnway (1-1000 c.p., 10-600 c.p.)	11
Memorial Drive (32-600 c.p. 181-250 c.p.)	213
Middlesex Fells Parkway (7-1500 c.p., 261-600 c.p.)	268 ³
Middlesex Fells Reservation (2-80 c.p., 35-250 c.p., 21-600 c.p.)	58 ⁴
Mystic Valley Parkway (1-250 c.p., 89-600 c.p.)	90 ⁵
Nahant Beach Parkway (1500 c.p.)	12 ⁶
Nantasket Beach Reservation (40-100 c.p., 12-600 c.p.)	52 ⁷
Neponset Bridge (600 c.p.)	16
Neponset River Parkway (600 c.p.)	18
Old Colony Parkway (49-1500 c.p., 2-1000 c.p.)	51
Quincy Shore Reservation (600 c.p.)	59 ⁸
Revere Beach Parkway (600 c.p.)	181 ⁹
Revere Beach Reservation (2-60 c.p., 1-40 c.p., 1-250 c.p., 107-1500 c.p.)	111 ¹⁰
River Street Bridge (250 c.p.)	8
Saugus River Bridge (100 c.p.)	7
Weeks Bridge (100 c.p.)	24
Western Avenue Bridge (250 c.p.)	8
West Roxbury Parkway (600 c.p.)	27 ¹¹
Winthrop Parkway (14-250 c.p., 7-600 c.p.)	21
Winthrop Shore Reservation (600 c.p.)	23
Woburn Parkway (600 c.p.)	4 ¹²
Total	<hr/> 1,793

¹ Seventeen all night, except November 1 to March 31, until 1 A. M.
² Seventeen all year until 1 A. M.
³ Fifty-three 600 c.p. March 15 to November 31. Four 600 c.p. all year until 1 A. M.
⁴ Two 80 c.p. and twenty-two 600 c.p. all year until 1 A. M.
⁵ Ten 600 c.p. all night, except November 1 to March 31, until 1 A. M. Thirty-two 600 c.p. all year until 1 A. M.
⁶ Five June 1 to December 1.
⁷ Twelve 600 c.p. and eleven 100 c.p. in summer only.
⁸ Forty-two all night, except November 1 to March 31 to 1 A. M. Eleven all night, April 1 to October 31.
⁹ Seventy-nine all night, April 1 to October 31.
¹⁰ Thirty-three 1500 c.p. all night, May 1 to October 31. Thirty-two 1500 c.p. to midnight June 1 to September 30. One 60 c.p. all night, May 1 to September 30.
¹¹ All night, except November 1 to March 31, until 1 A. M.
¹² Until 1 A. M.

TABLE 6

<i>Miles of Seashore</i>		Miles
Lynn Shore		1.50
Nahant Beach		2.93
Revere Beach		2.74
Winthrop Shore		1.71
Nantasket Beach		1.02
Quincy Shore		2.19
Total		12.09

<i>Lengths of Sea Walls</i>		Miles
Lynn Shore		1.30
Revere Beach at Northern Circle . . . . .		.08
Revere Beach at Eliot Circle . . . . .		.15
Revere Beach, shore protection, bath house shelter to Revere Street shelter . . . . .		.29
Winthrop Shore, bridge to Great Head		1.04
Winthrop Shore, bridge to Grover's Cliff . . . . .		.23
Revere Beach, shore protection, south of Northern Circle . . . . .		.28
Quincy Shore Reservation, shore protection south of Webster Street		1.08
Quincy Shore Reservation, southerly end . . . . .		.15
Nantasket Beach Reservation . . . . .		.54
Winthrop Parkway, Revere and Winthrop, Broad Sound Avenue, to Sewall Avenue . . . . .		.52
Total		5.66

<i>Miles of River Bank</i>		Miles
Charles River		33.97
Mystic River		8.41
Neponset River		15.86
Alewife Brook		4.50
Total		62.74

TABLE 7

<i>Bridges</i>		
Reinforced Concrete bridges		23
Steel bridges		15
Wooden bridges		7 ¹
Drawbridges		6
Footbridges		12
Total		63

<i>Culverts</i>		
Reinforced concrete and other masonry culverts		49

TABLE 8

<i>Dams</i>		
Beaver Brook Reservation, small wooden dams		2
Blue Hills Reservation, small wooden dam		1
Charles River Reservation, wooden dam at Watertown, 220 feet in length		1

¹ One half of Wellington Bridge rebuilt with concrete girders.

P.D. 48	21
Charles River Reservation, Charles River Basin, tidal dam, 1,200 feet in length	1
Charles River Reservation, small stone dam in branch below Washington Street, Newton Lower Falls	1
Charles River Reservation, reinforced concrete dam at Washington Street, Newton Lower Falls, 140 feet in length	1
Furnace Brook Parkway, reinforced concrete dam, upstream from Black's Creek Bridge	1
Hemlock Gorge Reservation, small stone masonry dam with stop planks, in gorge	1
Hemlock Gorge Reservation, small reinforced concrete dam on east branch of river, Newton Upper Falls	1
Hemlock Gorge Reservation, reinforced concrete dam in Charles River at Boylston Street, Newton Upper Falls, 90 feet in length	1
Mystic River Reservation, reinforced concrete tidal dam at Cradock Bridge, 100 feet in length; weirs 400 feet in length	1
Total	12

Lock Gates, Sluice Gates and Tide Gates

- Charles River Reservation, Charles River Basin Tidal Dam, 6 lock gates, 13 sluice gates, 43 tide gates.
- Mystic River Reservation, Cradock Bridge Tidal Dam, 2 lock gates, 4 sluice gates, 8 tide gates.
- Quincy Shore Reservation, 8 tide gates.

TABLE 9

<i>Police Signal System</i>	Miles
Blue Hills Division	31½
Middlesex Fells Division	27
Nantasket Beach Division	2½
Charles River Reservation	10
Fresh Pond Parkway	½
Total	71½

Revere Beach Division police signal system, serving 11 miles of parkways and reservations, and Middlesex Fells Division, serving 1½ miles of parkway, on wires leased from the New England Telephone and Telegraph Company.

**REPORT OF DIRECTOR AND CHIEF ENGINEER
OF WATER DIVISION**

DAVIS B. KENISTON, *Commissioner, Metropolitan District Commission.*

SIR:—I respectfully submit the following report of the construction and maintenance operations of the Water Division for the calendar year 1931.

Organization

At the beginning of the year there were 56 permanent employees in the main and branch offices, and 310 permanent and temporary employees engaged in maintaining and operating the reservoirs, aqueducts, pipe lines, hydroelectric and pumping stations and in doing miscellaneous construction work. Including the temporary force employed during the summer the maximum number of employees of all classes at any time during the year was 415. There are now 58 permanent employees in the main and branch offices and 306 permanent and temporary employees engaged in the maintenance and operation of the works.

Operations begun in 1930 to provide work for unemployed men in the Wachusett, Sudbury and Distribution sections were continued until early in August under special appropriations for this purpose, amounting to \$15,000, and 224 men were provided with some temporary work during this period.

Metropolitan Water District and Works

The Water District now includes 20 municipalities with an area of about 174 square miles and population as of July 1, 1931, of 1,522,580. The Water Works lands include an area of about 19,000 acres, of which about 2,000 acres have been planted with pine trees.

The works under the control of the Water Division include 9 storage reservoirs with 200 square miles of tributary watershed, a total storage capacity of 80 billion gallons and water surface of 8,600 acres; 60 miles of aqueducts; 2 hydroelectric power stations of a capacity of 7,000 horse-power; 16 miles of high-tension power transmission line; 5 distribution pumping stations with a combined equipment of 6,100 horse-power and pumping capacity of 282 million gallons a day; 12 distribution reservoirs with a capacity of 2.5 billion gallons, and 163.43 miles of distribution mains. The consumption of water from the Metropolitan Water Works during the year by the 18 municipalities regularly supplied was 49,193,818,000 gallons, equivalent to an average daily consumption of 134,777,600 gallons or 95.8 gallons per capita for a population of 1,405,890 in the district supplied.

The new intake works at Coldbrook, on the Ware River, and the tunnel from the intake to the Wachusett Reservoir were put into service March 21 and the flood flows in excess of 85 million gallons a day, from the 98 square miles of Ware River watershed above the intake, may now be diverted for the water supply of the Metropolitan Water District, except that between June 14 and October 15 no diversion is allowed and that between May 31 and June 15 and between October 14 and December 1 diversion can be made only if approved by the Department of Public Health.

Construction

WESTON AQUEDUCT SUPPLY MAINS

Early in the year work was resumed on the new Weston Aqueduct supply main which is being laid to connect the existing 60-inch supply mains in Commonwealth Avenue, near the Charles River in Newton, with the existing 48-inch low-service main in Magazine Street, near Memorial Drive in Cambridge. About 80 per cent of this main which will be 8.8 miles in length had been completed January 1, 1931.

Under Contract No. 79 with C. & R. Construction Company, 9,706 feet of electric-welded steel pipe, 60 inches in diameter, was laid in Wexford Street, private land, North Beacon Street and Charles River Reservation in Boston and Newton. The total amount of this contract is \$205,719.55 including \$8,888.60 for 6,349 square yards of bituminous macadam pavement in Nonantum Road, which was widened four feet for a distance of 3,600 feet in connection with the work of laying the water main in the park reservation. Under another contract, No. 81, with said Company, 6,354 feet of pipe, of the same kind and size, was laid in Elm and Washington streets in Newton and the total amount of this contract is \$100,648.99. Under Contract No. 83 with Thomas Joseph McCue 8,461 feet of electric-welded steel pipe, 60 inches in diameter, was laid in Washington, Peabody, Pearl, Centre, Galen and Maple streets in Newton and Watertown, and connected with the other completed sections of the line to form a continuous pipe line from Magazine Street in Cambridge to Elm Street in West Newton. Pipe laying was completed under Contract No. 83 so late in the year that the per-

manent resurfacing of the streets in Watertown was deferred so that the work could be done under favorable conditions in the spring of 1932.

Before the pipes were laid in Newton, the city had planned to rebuild Washington Street and as the pipe line was located in this street for a distance of 12,000 feet the Contractors were not required to permanently resurface the trenches in Newton, but from time to time the Commonwealth, in fulfillment of its obligations, paid to the city the estimated cost of resurfacing completed portions of the pipe line. The total of these payments to the city in lieu of resurfacing is \$24,211.96.

No settlements have been made for the easements and lands acquired for the new main between Wexford Street and North Beacon Street in Boston.

NORTHERN HIGH SERVICE PIPE LINES

The work of resurfacing the streets in Revere in which the new northern high service pipe line extending from Broadway to Winthrop and East Boston was laid in 1930, was resumed March 23, 1931, but following the completion of this work a number of joint leaks developed which, with other complications, delayed the final acceptance of the work until September.

Settlement for easements acquired for this pipe line have been made amounting to \$1,675.

METERS AND CONNECTIONS

In May a 16-inch by 8-inch Venturi meter connection was installed between the low-service main in North Harvard Street and the city of Boston water pipe at Spurr Street in Brighton to replace an existing emergency connection.

In September a 20-inch by 5¼-inch Venturi meter connection was installed between the new Weston Aqueduct supply main in Washington Street and the city of Newton water pipe at Watertown Street in West Newton, and in November a 20-inch by 5¼-inch Venturi meter connection was installed between the new supply main and the city water pipe at Church Street in the northeast part of the city.

In November a 12-inch by 5¼-inch Venture meter connection was installed between low-service main and the city of Chelsea water pipe in Marginal Street at Eastern Avenue at the expense of the city.

The total expenditures for meters and connections for 1931 is \$10,290.21.

PURCHASE OF WATER VALVES

Contract No. 80 for furnishing 73 water valves from 12 inches to 36 inches in diameter was made with the Crane Company March 2, 1931. All of the valves have been delivered. The amount of the contract is \$32,621.10.

ADDITIONAL PUMPING EQUIPMENT FOR CHESTNUT HILL STATION No. 1

Plans and specifications were prepared and bids were received December 31 for the installation, in Chestnut Hill Pumping Station No. 1, of two steam turbine driven centrifugal pumping units for the southern high service. The large unit of 1,400 horse-power will have a pumping capacity of 50 million gallons a day, the small unit of 625 horse-power will have a capacity of 15 million gallons a day. Of the \$150,000 required for this installation, the first installment of \$50,000 was appropriated April 24, Acts of 1931, Chapter 245, Item 695.

Maintenance

PRECIPITATION AND YIELD OF WATERSHEDS

The total precipitation during 1931 on the Wachusett watershed, 44.35 inches, is 0.49 of an inch below the average for 35 years; on the

Sudbury watershed 40.83 inches is 3.41 inches below the average for 57 years; and on the Cochituate watershed 42.92 inches is 1.83 inches below the average for 69 years.

The average daily yield per square mile from the watersheds was 972,000 gallons from the Wachusett, which is 90 per cent of the average for 35 years, 889,000 gallons from the Sudbury, which is 92 per cent of the average for 57 years, and 1,022,000 gallons from the Cochituate which is 110 per cent of the average for 69 years.

The city of Worcester diverted the entire yield of the 9.35 square miles of watershed formerly tributary to the Wachusetts Reservoir, which it acquired for its water supply in 1911, and also pumped 73,100,000 gallons of water from the reservoir with its emergency pumping plant at South Bay in Boylston.

From March 20, 1931 to the end of the year 12,920,600,000 gallons of water was diverted into Wachusett Reservoir from the Ware River watershed above Coldbrook through the new tunnel.

During the year 3,856,650,000 gallons of water was drawn for consumption from Framingham Reservoir No. 1, Ashland, Hopkinton and Whitehall reservoirs and the Sudbury River above Cordaville and 5,211,800,000 gallons was drawn from Lake Cochituate.

STORAGE RESERVOIRS

The capacities of the storage reservoirs of the Metropolitan Water Works, the elevation of the water surfaces and the quantity of water stored in each reservoir at the beginning and at the end of the year are shown by the following table:

STORAGE RESERVOIRS	Eleva- tion ¹ of High Water to top of flash boards	Total Capacity (Gallons)	JAN. 1, 1931		JAN. 1, 1932	
			Eleva- tion ¹ of Water Sur- face	Available Storage (Gallons)	Eleva- tion ¹ of Water Sur- face	Available Storage (Gallons)
Cochituate Watershed:—						
Lake Cochituate ²	144.36	2,097,100,000	142.90	1,656,000,000	140.85	1,187,500,000
Sudbury Watershed:—						
Sudbury Reservoir	260.00	7,253,500,000	250.82	2,403,400,000	258.15	5,229,500,000
Framingham Reservoir No. 1	169.32	289,900,000	167.66	124,400,000	167.67	124,800,000
Framingham Reservoir No. 2	177.12	529,900,000	175.92	428,400,000	175.93	428,800,000
Framingham Reservoir No. 3	186.74	1,180,000,000	183.98	797,900,000	184.97	876,600,000
Ashland Reservoir	225.21	1,416,400,000	203.36	34,400,000	225.30	1,005,300,000
Hopkinton Reservoir	305.00	1,520,900,000	286.71	118,300,000	297.66	632,800,000
Whitehall Reservoir	337.91	1,256,900,000	333.71	172,000,000	336.40	658,700,000
Wachusett Watershed:—						
Wachusett Reservoir	396.50	67,000,000,000	354.81	13,260,000,000	374.77	29,923,000,000
Totals	—	82,544,600,000	—	18,994,800,000	—	40,067,000,000

¹ Elevation in feet above Boston City Base.
² Excluding Dudley Pond which was abandoned April 3, 1916.

The total storage capacity shown in the third column of the table is to the bottom of the reservoirs. The available storage shown in columns 5 and 7 is the quantity that can be conveniently used for consumption.

Wachusett Reservoir

On January 1, 1931 the water in Wachusett Reservoir was 40.19 feet below high-water line and the quantity of water stored in the reservoir was 24,260,000,000 gallons. On February 13, the water reached the lowest stage recorded since the reservoir first filled in 1908, it was then at elevation 350 and 45 feet below high-water line, and there was then only 10,944,400,000 gallons of water stored in the reservoir that could

be conveniently used for water supply; but as a result of the large yield during the spring the water rose in the reservoir to elevation 388.79 on June 22, the quantity of water stored in the reservoir having been increased 35,867,200,000 gallons. For 10 weeks during this filling period no water was drawn from the reservoir for consumption, and between March 20 and June 15 and between October 14 and the end of the year the flow of the Ware River at Coldbrook, in excess of 85,000,000 gallons a day, was diverted into the Wachusett Reservoir through the new tunnel. From June 22 to the end of the year water was drawn from the reservoir regularly for consumption and at the close of the year had been drawn down to elevation 374.77 or 20.23 feet below high-water line, leaving 30,923,000,000 gallons in the reservoir available for water supply purposes.

Under the provisions of Acts of 1923 Chapter 348 the town of Clinton pumped 10,100,000 gallons of water from the reservoir on 7 days in February, 5 days in May and 7 days in June to maintain pressures in its distribution system during periods of high consumption and when repairs were being made.

The city of Worcester pumped 73,100,000 gallons of water from the reservoir from January 1 to 14, inclusive, on account of the low water in its reservoir, as its new works, for taking water from the Quinapoxet Pond drainage area in the Wachusett watershed as authorized by the Acts of 1926 Chapter 375, Section 12, were not completed until July. No water was diverted from Quinapoxet Pond by the city during the year.

In compliance with the provisions of General Laws Chapter 92, Section 14, that at least 12 million gallons of water shall be discharged each week from the reservoir into the Nashua River to maintain a flow in the river below the dam, 625,600,000 gallons of water was discharged from the reservoir into the river during the year.

The usual regular work has been done in connection with the maintenance and operation of the Wachusett Reservoir.

Sudbury Reservoir

At the beginning of the year the water in Sudbury Reservoir was about 8 feet below the crest of the overflow at the dam, having been drawn down in November, 1930 to facilitate the work of widening and rebuilding Worcester Street in Southborough as a State highway by the Department of Public Works. This work includes the extension of several culverts and the construction, on Water Works land, of highway embankments which in some places extend out into the reservoir.

From January 1 to August 10 the water was kept approximately 4 feet below the crest of the overflow at the dam; the water was then allowed to rise in the reservoir until September 20 when it was filled to the crest of the overflow. From December 3, when the flashboards were removed from the overflow, to the end of the year the water was held about a foot below the overflow.

The usual work was done in connection with the maintenance and operation of the reservoir. The dump truck which had been used at the reservoir for several years was replaced by a new truck during the year.

Framingham Reservoir No. 3

Flashboards were kept on the overflow of the dam at Framingham Reservoir No. 3 during the entire year so that the reservoir could be replenished with water from Sudbury Reservoir as required to conveniently control the flow in the Sudbury Aqueduct which was supplied almost entirely from this reservoir. The highest elevation of the water in the reservoir during the year was 185.74 on April 7 and the lowest was 181.41 on February 26. No water was wasted from the reservoir during the year. The work required to maintain and operate the reser-

voir has been performed in the usual manner. Some of the filling for the new State highway along the Worcester Turnpike extended into the small arms of the reservoir south of the turnpike.

Ashland, Hopkinton and Whitehall Reservoirs

At the beginning of the year the water had been drawn down nearly 22 feet in Ashland Reservoir, but on account of abundant spring yield the reservoir had filled to high-water line by April 10, and remained full for the rest of the year; although 803,600,000 gallons of water was drawn from the reservoir for water supply, February 19 to April 1 and April 8 to June 16. A bathroom was installed in the department house occupied by the attendant.

The water in Hopkinton Reservoir was about 18 feet below full reservoir level at the beginning of the year, it rose steadily until high-water line was reached on April 1 and remained near that level until June 20, the water then receded and was 8.2 feet below high water August 24; during the remaining 4 months it rose slowly and was 7.5 feet down at the close of the year. Water was diverted from the reservoir to Sudbury Reservoir from February 10 to March 3, one hour on March 15 and from March 31 to August 24. The total diversion during the year from Hopkinton Reservoir to Sudbury Reservoir was 2,243,120,000 gallons. From the Sudbury River above Cordaville 466,330,000 gallons was diverted to the Sudbury Reservoir, and from Whitehall Reservoir to Hopkinton Reservoir the total diversion was about 400,000,000 gallons.

The water in Whitehall Reservoir rose 4.2 feet from January 1 to April 10 when it reached high-water line. From April 13 to August 11 water was diverted from Whitehall to Hopkinton Reservoir, the water in Whitehall Reservoir being drawn down 1.5 feet and remained at that level until the end of the year. A small flow was maintained through the pipe line, to keep the water from freezing, from January 1 to March 25 and from December 8 to 31. From June 10 to 19 it was necessary to waste water from Whitehall Reservoir into the brook below the dam to keep the water from rising too high in the reservoir.

Framingham Reservoirs Nos. 1 and 2 and Farm Pond

Water is seldom drawn from Framingham Reservoirs No. 1 and No. 2 for water supply but on account of extremely low water in the other reservoirs 343,600,000 gallons was used from Reservoir No. 1 January 12 to February 19 as analyses showed that the water was then of very good quality. As usual 1.5 million gallons was discharged, through the calibrated gate at Dam No. 1, into the Sudbury River as required by law.

The town of Framingham pumped 143,700,000 gallons of water from its filter galleries on the shore of Farm Pond from March 7 to November 3 and from December 19 to the end of the year.

Under legislative authority the Boston & Albany Railroad took approximately 21,900,000 gallons and the New York, New Haven & Hartford Railroad about 13,500,000 gallons of water directly from Farm Pond for use in locomotives and 67,800,000 gallons of water was wasted from the pond into the Sudbury River.

In connection with the rebuilding of the Worcester Turnpike as a State highway the Department of Public Works constructed a new bridge over the channel between Framingham Reservoirs Nos. 1 and 3, and also reinforced both of the 48-inch pipe lines at this place.

Lake Cochituate

From January 1 to October 26, inclusive, 5,211,800,000 gallons of water was drawn from Lake Cochituate for water supply. The water in the lake was 1.5 feet below high-water line at the beginning of the year, 4 inches above on June 11, 5 feet below on October 27 and 3.5 feet below high water at the close of the year.

During March, April, May and June 1,446,400,000 gallons of water was wasted to keep the water from rising too high in the lake.

AQUEDUCTS

The *Wachusett Aqueduct* was used on 246 days during the year, for a total time of 105 days, 14 hours and 44 minutes. The total quantity of water drawn from the Wachusett Reservoir through the aqueduct is 33,926,100,000 gallons, an average draft of 92,948,000 gallons for every day in the year, and all but 24,000,000 gallons of the water was used to generate electric energy at the Wachusett Power Station before it was discharged into the aqueduct.

The Westborough State Hospital pumped 57,521,000 gallons of water from the aqueduct at the terminal chamber in Marlborough during the year, an average daily pumpage of 158,000 gallons. This is the smallest daily consumption at this institution for years and is due to a saving resulting from an efficient system of regular inspection of water fixtures and the use of water.

In connection with the reconstruction of the Boston-New York Post Road in Northborough, a reinforced concrete plate girder bridge was built by the Public Works Department to carry the highway over the aqueduct at Mitchell Swamp and as a further safeguard steel sheet piling was driven into the hard ground under the swamp parallel with and on each side of the aqueduct for a distance of 150 feet or the entire width of the highway embankment.

The *Weston Aqueduct* was used every day in the year, the total time in service amounting to 312 days, 17 hours and 59 minutes. During this time 32,205,600,000 gallons of water was conveyed from the Sudbury Reservoir to the Weston Reservoir, of which 2,004,400,000 gallons was by-passed into the aqueduct through the gate under Unit No. 1 on account of low water in the Sudbury Reservoir, and the remainder was used to generate electric energy before it was discharged into the aqueduct. The average daily flow in this aqueduct for the entire year was 88,234,521 gallons.

The house and barn at the White place in Nobscot were painted and the barn was shingled with asphalt shingles.

The *Sudbury Aqueduct* was in use throughout the year with the exception of a short interruption on October 14 and again on October 15 while changing the chlorinator suction pipe. The aqueduct was supplied with 9,004,900,000 gallons of water from Framingham Reservoir No. 3 with 803,600,000 gallons of water from Ashland Reservoir and with 343,600,000 gallons of water from Framingham Reservoir No. 1, a total of 10,152,100,000 gallons, of which the town of Framingham pumped 376,100,000 gallons for its supply and the remaining 9,776,000,000 gallons, equivalent to an average of 26,783,562 gallons a day, was delivered to Chestnut Hill Reservoir for consumption in the Metropolitan Water District.

In October the town of Framingham completed its new pumping station which is located on Metropolitan Water Works land on the east side of Winter Street near the aqueduct, but on account of construction troubles it has not been used for regular service.

The *Cochituate Aqueduct* was in service January 1 to October 26, a total of 299 days. While the aqueduct was in use 5,211,800,000 gallons of water was conveyed from Lake Cochituate to Chestnut Hill Reservoir, equivalent to an average flow of 14,278,904 gallons a day for the entire year.

The regular maintenance of the aqueduct lands and structures was attended to in the usual manner.

PROTECTION OF THE WATER SUPPLY

To prevent pollution of the water supply a Sanitary Engineer and two aids and six watchmen have been employed throughout the year to

inspect ice cutting and other operations, and the condition of the premises on the watersheds, and to enforce the sanitary rules and regulations. The Sanitary Engineer and one aid also made a sanitary census of the Swift River watershed for the Metropolitan District Water Supply Commission.

The water Division forces have operated the filter-beds on Beaman Street in West Boylston throughout the year to purify the sewage from the Worcester County Training School, and the Gates Terrace filter-beds at Sterling Junction from May 1 to November 29 to purify the sewage from summer cottages in that vicinity. Sewage from the Eagleville Mill and the Mt. Pleasant House in Holden, and from the Fay School and Deerfoot Farm sausage factory and dairy in Southborough was purified by privately owned and operated filter-beds.

Surface water from thickly settled drainage areas of 525 acres in the village of Sterling from 1,280 acres along the brook near Maple Street in Marlborough, and from 700 acres along Pegan Brook and an intercepting ditch in Natick was purified by filters operated by Water Division forces before it flowed into the water supply, with the exception of an overflow of 15,247,000 gallons from Pegan Brook and 69,794,000 gallons from the intercepting ditch in Natick, and this water that overflowed was sterilized with chlorine before it entered Lake Cochituate.

At the Pegan Brook filters the pumping station was operated on 235 days and 247,150,000 gallons of water was pumped to the filters, an average of 677,123 gallons a day for the entire year. The cost of operating the station and caring for grounds and filter beds was \$6,369.22 for labor, \$445.86 for fuel, and \$157.90 for supplies and repairs, a total of \$6,972.98, which is \$28.21 per million gallons filtered. The fuel cost per million foot gallons was \$0.15.

The cost of protecting the water supply by filtration was \$1,232 for the Wachusett, \$4,773.59 for the Sudbury and \$6,972.98 for the Cochituate watershed.

The new sewage disposal works constructed by Regis College to prevent pollution of the water in the Weston Aqueduct and Reservoir were put into regular service December 7. Prior to that time the sewage was sterilized with chlorine by the College before it was discharged on the old filter-beds and the surface water in a nearby brook was sterilized by Metropolitan Water Works employees.

The water diverted to the Sudbury Reservoir from the Hopkinton Reservoir and from the Sudbury River above Cordaville was sterilized with chlorine at the Cordaville pumping station.

All water drawn for consumption during the year was sterilized with chlorine as follows: Water from Ashland Reservoir and Framingham Reservoirs Nos. 1 and 3 at the entrance to the Sudbury Aqueduct; water from Lake Cochituate as it flowed from the Cochituate Aqueduct into Chestnut Hill Reservoir and water drawn from the Weston Reservoir at the screen chamber as it flowed from the reservoir.

The total amount of chlorine used was as follows: Sudbury Section 57,256 pounds, Distribution Section 153,152 pounds, total 210,408 pounds. The total expenditure for chlorine used in sterilizing the water supply during the year was \$8,951.74.

Improved brook channels, ditches, culverts and watering places were maintained in the usual manner. The cost of maintaining 35 miles of drainage ditches on all of the watersheds was \$8,055.

CLINTON SEWAGE DISPOSAL WORKS

The works constructed under the provision of Acts of 1898, Chapter 557, for disposing of the sewage of the town of Clinton, were operated on 365 days. The average daily quantity of sewage pumped and disposed of was 1,334,000 gallons. The cost of operating the pumping station was \$3,227.45 which is \$6.63 per million gallons and is \$0.13 per

million foot gallons. The cost of operating the filters and intercepting sewer was \$10,675.92, which is \$21.93 per million gallons disposed of by sedimentation, filtration and irrigation.

FORESTRY

In the Wachusett Section 111,500 white pine, 5,000 Austrian pine and 5,000 Scotch pine transplants were set out in new plantings. In the Sudbury section 2,950 white pine, 1,000 red pine and 230 spruce transplants were set out in new plantings. In the Distribution Section 7,800 white pines, 5,550 Scotch pines, 2,500 spruce and 18 cedar trees were set out in new plantings.

In the Wachusett Section about 70 miles of marginal fire guards and forest roads, 15 to 45 feet in width, were mowed and the brush and weeds were burned at a cost of about \$70 a mile and the undergrowth was cleared from a strip of Water Works land about 100 feet in width and 15½ miles in length fronting on main highways around the reservoir, and the lower branches of the trees were cut off for a height of about 6 feet. This work covered an area of about 230 acres and cost about \$25 an acre.

About 11,300 chestnut fence posts, 41,000 feet of chestnut lumber and 52,000 feet of white pine lumber was obtained from wood cutting operations in the Wachusett Section.

The total expenditure for forestry was \$37,567.46, of which \$3,120 was expended for protecting the trees and shrubs from insects.

HYDROELECTRIC SERVICE

The hydroelectric power stations at the Wachusett Dam in Clinton and at the Sudbury Dam in Southborough are operated by the water drawn for water supply from the reservoirs above these dams.

Only 9,469,596 kilowatt hours of electric energy was developed at the power stations in 1931, or approximately 70 per cent of the usual output. On account of low water in Wachusett Reservoir early in the year the Wachusett station was not operated for ten weeks, from February 15 to 28 and from March 15 to May 10; on account of reconstruction of Worcester Street in Southborough by the Department of Public Works water was maintained below high water in Sudbury Reservoir while several highway culverts were being extended, and from January 1 to 26 units Nos. 1 and 2 at the Sudbury power station could not be operated.

The value of the energy delivered in 1931 at contract prices is \$58,-465.74 and deducting \$56,849.61, the expenditures charged to the operation of both stations and the Water Division transmission line, there was a profit of \$1,616.13.

Wachusett Station

The easterly portion of the 66,000-volt transmission line connecting the Wachusett and Sudbury power stations was reconditioned for a distance of 7.67 miles. In connection with this work 15 new wooden poles were set, 14 of the original wooden poles were equipped with concrete pole mounts, the butts of 175 old wooden poles were chipped and treated with preservative, and 8 steel towers were scraped and painted.

The power station was operated on 244 working days during the year, and was not operated from February 13 to 28 and from March 14 to May 11 on account of the low water in the reservoir, or on Sundays and holidays. The statistics are as follows:

Total energy developed (kilowatt hours)	5,973,600
Energy used at power station (kilowatt hours)	31,520
<hr/>	
Available energy (kilowatt hours)	5,942,080
Water used (gallons)	33,902,100,000
Average head (feet)	78.0
Energy developed per million foot gallons (kilowatt hours)	2.259
Efficiency of station (per cent)	71.9

Credits:

Energy sold New England Power Company
and Edison Electric Illuminating Com-
pany: 5,753,927 kilowatt hours at \$0.00625 \$35,962.04

Deduction of 2 per cent as provided in
contract:

115,079 kilowatt hours at \$0.00625 719.24

Energy furnished Clinton Sewerage Pumping
Station:

188,153 kilowatt hours at \$0.00625 1,175.96

\$36,418.76

Charges:

Superintendence \$1,648.12

Labor, operating station 10,109.00

Repairs and supplies 1,781.91

Transmission line repairs and supplies 139.17

13,678.20

Taxes 3,750.00

Administration, general supervision, interest
and sinking fund 13,858.45

\$31,286.65

Profit \$5,132.11

Cost of available energy per thousand kilowatt hours \$5.265

Sudbury Station

The Sudbury power station was operated on 352 days during the year; on 200 days for 24 hours with three shifts, on 140 days for 16 hours with two shifts and on 12 days for 8 hours with one shift. From January 1 to 26 the Sudbury Reservoir was too low to properly supply the Weston Aqueduct through Units Nos. 1 and 2 and during this period 2,004,400,000 gallons of water was by-passed around the units into the aqueduct.

The statistics are as follows:

Total energy developed (kilowatt hours) 3,594,110

Energy used at power station (kilowatt hours) 66,594

Available energy (kilowatt hours) 3,527,516

Framingham Reservoir No. 3 service:

Water used (gallons) 7,477,300,000

Average head (feet) 63.87

Weston Aqueduct service:

Water used (gallons) 30,201,200,000

Average head (feet) 37.03

Energy developed per million foot gallons (kilowatt hours) 2.252

Efficiency of station (per cent) 71.7

Credits:

Energy sold Edison Electric Illuminating Company:

3,527,516 kilowatt hours at \$0.00625 \$22,046.98

Charges:

Superintendence	\$1,575.52	
Labor, operating station	13,908.14	
Repairs and supplies	546.21	
	<hr/>	
	\$16,029.87	
Taxes	1,922.00	
Administration, general supervision, interest and sinking fund	7,611.09	
	<hr/>	
		\$25,562.96
Loss		\$3,515.98
Cost of available energy per thousand kilowatt hours		\$7.247

DISTRIBUTION PUMPING STATIONS

At the five distribution pumping stations 31,269 million gallons of water was pumped during 1931; this is 2,299 million gallons more than was pumped at these stations during the previous year. The water pumped at the Chestnut Hill Station included 8,767 million gallons for the low service and 16,887 million gallons for the high service, which includes 73 million gallons for a portion of the supply of the town of Brookline, 51 million gallons for a portion of the supply of the city of Newton and 603 million gallons which was repumped at the Hyde Park Station for the southern extra high service. At the Spot Pond Station 4,386 million gallons was pumped for the northern high service and at the Arlington Station 627 million gallons was pumped for the northern extra high service. By arrangement with the city of Newton 530 million gallons of water was repumped from the southern high service from November 26, 1930 to November 27, 1931 by the city at its Ward Street booster station for use on the high land in Belmont and Watertown where satisfactory service cannot be furnished from the Chestnut Hill Station, and for this pumping the Commonwealth has paid the city \$7,239.61.

The average engine duties at the Water Division stations based on plunger displacement and total coal used for all purposes, including heating and lighting the stations, are as follows:

Chestnut Hill Station No. 1, 127,912,796 foot pounds per 100 pounds of bituminous coal averaging 14,728 British thermal units per pound.

Chestnut Hill Station No. 2, 140,388,667 foot pounds per 100 pounds of bituminous coal averaging 14,728 British thermal units per pound.

Spot Pond Station, 105,068,119 foot pounds per 100 pounds of bituminous coal averaging 14,713 British thermal units per pound.

Arlington Station, 98,593,814 foot pounds per 100 pounds of bituminous coal averaging 14,670 British thermal units per pound.

Hyde Park Station, 78,555,335 foot pounds per 100 pounds of mixed bituminous and anthracite coal averaging 14,120 British thermal units per pound. The fires are banked for a portion of each day at this station.

At the beginning of the year there was 2,382 net tons of bituminous coal and 20 net tons of anthracite screenings on hand at the pumping stations and the amount on hand at the end of the year was 1,363 net tons of bituminous coal and 47 net tons of anthracite screenings.

The roofs of the Pumping Service buildings at Chestnut Hill have been repaired and the exterior and interior metalwork and woodwork have been painted at all stations where necessary.

Boilers have been regularly inspected and engines and auxiliaries have been repaired as necessary to keep them in first class and dependable condition and considerable old piping has been replaced with new as required.

Iron galleries were erected under the steam mains in the boiler room at Chestnut Hill Station No. 1. Old Boilers Nos. 8 and 9 at Spot Pond

and Nos. 11 and 12 at Chestnut Hill Station No. 1 were removed and new boiler No. 25 was installed at Spot Pond and new boilers Nos. 26 and 27 were installed at Chestnut Hill Station No. 1.

Expenditures for this work amounted to \$29,769.60.

In addition to the regular work for all of the pumping stations a large amount of miscellaneous work has been done at the Pumping Service blacksmith, carpenter and machine shops for the Distribution, Sudbury and Wachusett sections.

DISTRIBUTION RESERVOIRS

The locations, elevations and capacities of the distribution reservoirs of the Metropolitan Water Works are shown by the following table:

DISTRIBUTION RESERVOIRS AND LOCATIONS	Elevation of High Water ¹	Capacity in Gallons
Low Service:		
Spot Pond, Stoneham and Medford	163.00	1,791,700,000
Chestnut Hill Reservoir, Brighton district of Boston	134.00	300,000,000
Weston Reservoir, Weston	200.00	200,000,000
Mystic Reservoir, Medford	157.00	26,200,000
Northern High Service:		
Fells Reservoir, Stoneham	271.00	41,400,000
Bear Hill Reservoir, Stoneham	300.00	2,450,000
Northern Extra High Service:		
Arlington Reservoir, steel tank, Arlington	442.50	2,000,000
Southern High Service:		
Fisher Hill Reservoir, Brookline	251.00	15,500,000
Waban Hill Reservoir, Newton	264.50	13,500,000
Forbes Hill Reservoir, Quincy	192.00	5,100,000
Forbes Hill Standpipe, Quincy	251.00	330,000
Southern Extra High Service:		
Bellevue Reservoir, steel tank, West Roxbury district of Boston	375.00	2,500,000
Total	—	2,400,680,000

¹ Elevation in feet above Boston City Base.

Powder Horn Hill Reservoir of the city of Chelsea is used when necessary for the northern high service. It has a capacity of 1,000,000 gallons with high-water line at elevation 196.6 and was in service from January 1 to April 13 and December 12 to the end of the year.

The Mystic and Forbes Hill reservoirs have been kept full of water for an emergency but were not used during the year.

The Lawrence basin of the Chestnut Hill Reservoir was out of service from January 1 to February 7 and from November 12 to the end of the year.

All other distribution reservoirs were in regular service throughout the year.

Under Contract No. 47-M the Beacon Equipment Company furnished and erected 5,749 linear feet of iron picket fence for enclosing the Lawrence basin of the Chestnut Hill Reservoir at a cost of \$10,894.36.

The Parks Division was paid \$6,265.52 for police service at Chestnut Hill Reservoir and at Spot Pond, Fells and Bear Hill reservoirs.

DISTRIBUTION PIPE LINES

The 12-inch northern high service main in Atlantic Avenue, Revere, was relaid for a distance of 650 feet where the street had been constructed over a salt marsh and a number of leaks had resulted from abnormal corrosion of the water pipe.

In connection with the widening and rebuilding of the Morton Street bridge over the New York, New Haven and Hartford Railroad in Dorchester, electric-welded steel pipes, 30 inches in diameter, were laid over the railroad on the new bridge to replace the old 36-inch southern high service cast-iron main under the railroad, which was abandoned.

In connection with the construction of a new concrete culvert for Stony Brook under Hyde Park Avenue, West Roxbury, the 24-inch southern high service pipe line was relocated for a distance of 93 feet.

In connection with the rebuilding of the Adams Street bridge, over the Neponset River at Milton Lower Mills, new steel beams were installed to support the two 24-inch southern high service mains, which are enclosed in wooden boxes to insulate them from cold weather.

On December 3 a break occurred in the 24-inch northern high service main in Washington Avenue in Chelsea, which did not cause any serious damage and was repaired at a cost of \$382.38.

During the year 33 leaks occurred in the distribution mains which were repaired at a cost of \$2,815.23.

There are 87 Venturi meters, varying in size from 6 to 60 inches in diameter, in the distribution pipe lines; 72 of these are on connections supplying various towns in the Metropolitan Water District; 5 are on the Weston Aqueduct supply mains; 1 between the southern high service and the southern low service mains; 3 at the Arlington, Hyde Park and Spot Pond pumping stations; 1 at the city of Newton booster pumping station on Waban Hill; 2 on connections between the Weston Aqueduct supply mains and the local pipes in Washington Street, Newton; 1 on connection to the Fernald School in Waltham, and 2 on emergency connections with Cambridge and Wakefield distribution pipes. There are also 9 disc and 16 detector meters in use for measuring small quantities of water supplied at various places.

There are 6 pressure regulating valves in constant use for reducing pressure of water supplied to Revere, Swampscott and Winthrop, and the higher portions of Belmont, East Boston and Hyde Park.

Recording pressure gages have been maintained at 28 places on the distribution system and tables in the Appendix show the hydraulic grade at 16 of these stations as determined by the charts.

Pipes, specials and other materials and supplies required for maintaining and operating the pipes lines are kept on hand at the Glenwood pipe yard in Medford and Chestnut Hill pipe yard in Brighton.

Auto trucks equipped with gate-operating attachments have been maintained with men on duty ready to operate them in case of emergency at any time during the day or night.

CONSUMPTION OF WATER

During the year 49,193,818,000 gallons of water was furnished from the Metropolitan Water Works to the 18 cities and town regularly supplied. This is equivalent to an average daily consumption of 134,777,600 gallons, and for the estimated population of 1,405,890 is at the rate of 95.8 gallons per capita.

The town of Brookline, with an estimated population of 48,980, used from its local source 1,769,372,000 gallons of water, of which 347,390,000 gallons was supplied from elevation 375 and 1,421,982,000 gallons was supplied from elevation 250. In addition to this consumption the town was supplied with some water from the Metropolitan Water Works every month in the year except June. The total quantity supplied from the Metropolitan Water Works is estimated as 73,283,000 gallons, making the total average daily consumption of the town 4,847,600 gallons, equivalent to 99 gallons per capita.

The city of Newton, with an estimated population of 67,710, was supplied from its local sources, with the exception of 50,613,000 gallons, which was furnished from the Metropolitan supply. Including this water, the average daily consumption was 4,948,300, equivalent to 73 gallons per capita. The amount of water furnished the city of Newton from the Metropolitan supply is 37,113,000 gallons in excess of the quantity which the city is entitled to take free of charge under the

agreement made in 1900 when the Waban Hill Reservoir was purchased from the city, and for this water the city will pay \$3,516.46.

The population, consumption of water and per cent of services metered in the Metropolitan Water District as supplied in 1931 and for the period from 1890 to 1931, inclusive, are shown graphically by the accompanying diagram.

The average daily consumption of water in each of the municipalities in the Metropolitan Water District during 1930 and 1931 is as follows:

	Estimated Popula- tion, 1931	AVERAGE DAILY CONSUMPTION				
		1930		1931		Decrease in Gallons
		Gallons	Gallons per Capita	Gallons	Gallons per Capita	
Arlington	38,520	1,982,100	54	1,997,900	52	15,800 ¹
Belmont	23,150	1,308,500	59	1,323,300	57	14,800 ¹
Boston	782,020	92,286,000	118	89,753,100	115	2,532,900
Chelsea	46,390	3,569,400	78	3,580,400	77	11,000 ¹
Everett	49,790	4,966,500	102	4,900,300	98	66,200
Lexington	9,840	630,100	66	647,800	66	17,700 ¹
Malden	59,680	3,645,600	62	3,882,700	65	237,100 ¹
Medford	62,460	3,356,900	56	3,341,100	53	15,800
Melrose	23,860	1,628,900	70	1,659,000	70	30,100 ¹
Milton	17,290	868,700	52	902,800	52	34,100 ¹
Nahant	1,670	197,000	119	205,000	123	8,000 ¹
Quincy	74,600	5,498,700	76	5,263,800	71	234,900
Revere	36,640	2,225,200	62	2,284,300	62	59,100 ¹
Somerville	105,320	9,376,200	90	10,135,500	96	759,300 ¹
Stoneham	10,250	690,400	68	686,600	67	3,800
Swampscott	10,640	811,300	78	799,300	75	12,000
Watertown	36,700	2,168,100	61	2,168,100	59	-
Winthrop	17,070	1,206,900	71	1,246,600	73	39,700 ¹
District supplied	1,405,890	136,416,500	98	134,777,600	96	1,638,900
Brookline	48,980	4,697,700	98	4,847,600	99	149,900 ¹
Newton	67,710	4,998,100	76	4,948,300	73	49,800
Total District	1,522,580	146,112,300	97	144,573,500	95	1,538,800

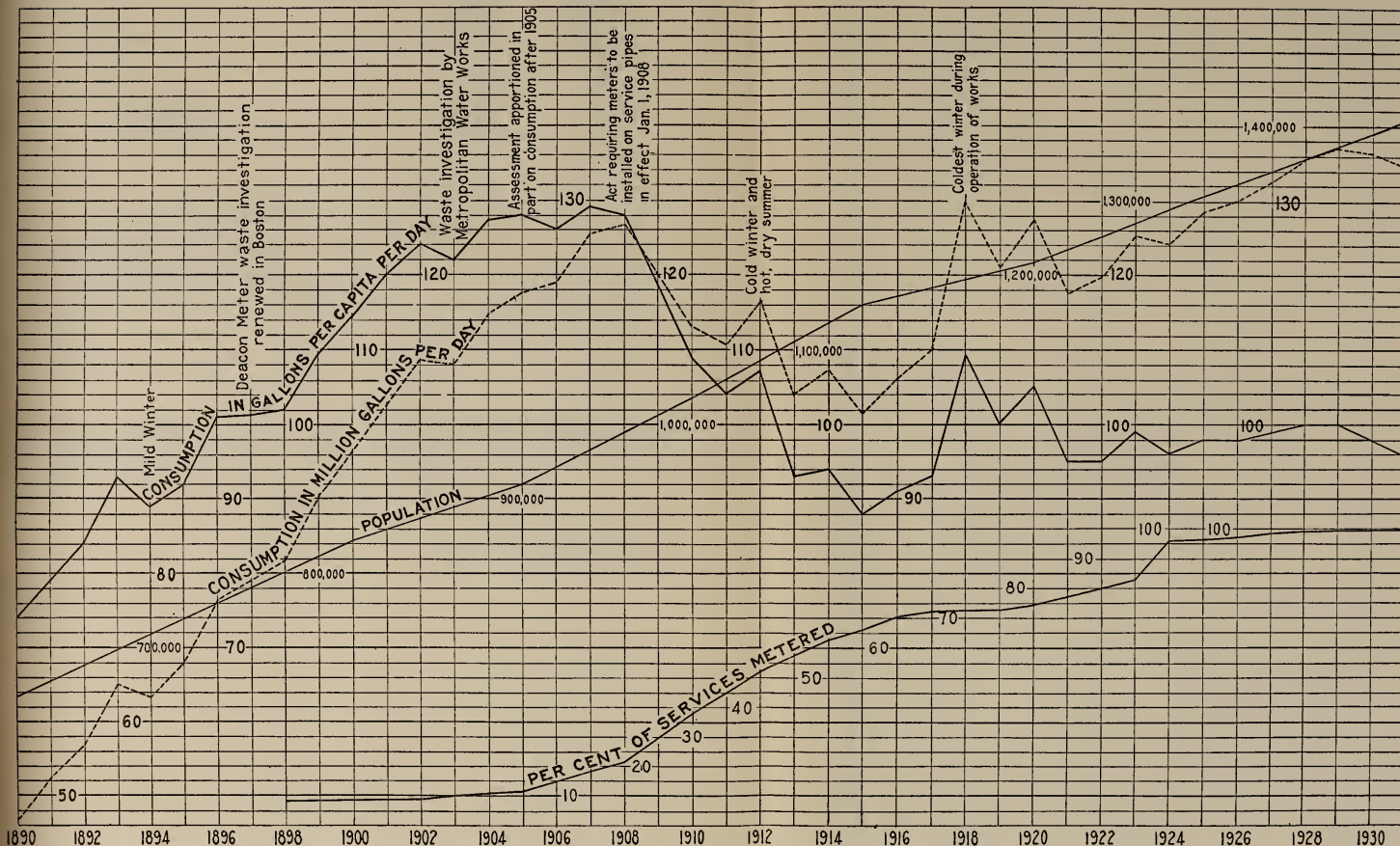
¹ Increase.

The consumption by districts in 1931 as compared with 1930 is as follows:

	Gallons per Day 1931	DECREASE FROM 1930	
		Gallons per Day	Percent- age
Low service district, embracing the low-service districts of Arlington, Belmont, Boston, Chelsea, Everett, Malden, Medford, Somerville and Watertown	71,517,500	834,500	1.15
Southern high-service district, embracing Quincy, the high-service district of Boston, except East Boston, and portions of Milton and Watertown	45,538,200	1,403,700	2.99
Southern intermediate high-service district, embracing portions of Belmont and Watertown	1,433,600	2,000 ¹	0.14 ¹
Northern high-service district, embracing Melrose, Nahant, Revere, Stoneham, Swampscott, and Winthrop and the high-service districts of Chelsea, East Boston, Everett, Malden, Medford and Somerville	12,871,400	363,800 ¹	2.91 ¹
Southern extra high-service district, embracing the higher portions of Hyde Park, Milton and West Roxbury	1,678,500	211,100 ¹	14.39 ¹
Northern extra high-service district, embracing Lexington and the higher portions of Arlington and Belmont	1,738,400	22,400 ¹	1.31 ¹
District Supplied	134,777,600	1,638,900	1.20
Brookline and Newton	9,795,900	100,100 ¹	1.03 ¹
Total District	144,573,500	1,538,800	1.05

¹ Increase.

POPULATION, CONSUMPTION OF WATER AND PER CENT OF SERVICES METERED
IN THE
METROPOLITAN WATER DISTRICT
AS SUPPLIED IN 1931
FROM 1890 TO 1931



Note: Estimated population and consumption per capita given on diagrams published in previous annual reports are revised from time to time as regular census figures become available.

WATER FROM METROPOLITAN WATER WORKS SOURCES USED OUTSIDE OF THE METROPOLITAN WATER DISTRICT

PLACES WHERE WATER IS USED	Total Quantity (Gallons)	Average Quantity (Gallons per Day)	Amount Charged
Town of Rutland	83,200,000 ¹	227,950	-
Town of Holden	24,000,000 ²	65,750	-
Town of Clinton	10,100,000	27,670	-
Westborough State Hospital	57,521,000	157,590	\$1,725.63
Town of Westborough	76,000,000	208,220	-
Town of Southborough	28,615,000	78,400	-
City of Worcester	73,100,000	200,270	-
Town of Ashland	61,813,000	169,350	-
Town of Hopkinton	21,992,000	60,250	-
Town of Framingham	376,139,000	1,030,520	14,495.02
Town of Natick	277,140,000	759,290	-
United States Army Reservation at Peddock's Island in Hull	1,138,000	3,120	99.66 ³
Portion of Town of Braintree	168,000 ⁴	460	-
Portion of Town of Winchester	670,000 ⁵	1,840	-
Portion of Town of Saugus	506,000 ⁶	1,390	-
Metropolitan Parks, Middlesex Fells	6,236,000	17,090	-
Walter E. Fernald State School and Metropolitan State Hospital	123,863,000	339,350	9,765.43

Notes. — Water is used throughout the year in all places except the town of Clinton, which took water on 19 days and the city of Worcester, which took water on 14 days.
The average daily use is in all cases figured on basis of 365 days.
¹ All but 404,000 gallons diverted from watershed.
² Not diverted from watershed.
³ Water supplied by the Commission through City of Quincy pipes, and by agreement revenue is divided in equal shares between the City and Commonwealth.
⁴ The City of Quincy supplies the water and pays the Commonwealth by an addition to its regular apportionment.
⁵ The Town of Arlington supplies the water and pays the Commonwealth by an addition to its regular apportionment.
⁶ The City of Melrose supplies the water and pays the Commonwealth by an addition to its regular apportionment.

Information regarding the installation of meters on service pipes by the municipalities supplied with water from the Metropolitan Water Works for the year 1931 and other statistics are given in tables in the Appendix.

Respectfully submitted,

WILLIAM E. FOSS,
Director and Chief Engineer.

Boston, January 2, 1932.

REPORT OF DIRECTOR AND CHIEF ENGINEER OF SEWERAGE DIVISION

DAVIS B. KENISTON, *Commissioner, Metropolitan District Commission.*

DEAR SIR:—The following report of the operations of the Metropolitan Sewerage Works for the year ending December 31, 1931, is respectfully submitted:

ORGANIZATION

The Director and Chief Engineer has charge of the design and construction of all new works, and of the maintenance and operation of all the works controlled by the Metropolitan District Commission for removing sewage from the thirty-three municipalities which comprise the Metropolitan Sewerage Districts.

The following assistants have been employed during the year:

Henry T. Stiff, Associate Civil Engineer, in charge of office and drafting room and of the construction work.

Ralph W. Loud, Senior Civil Engineer, in charge of survey work and field work in connection with the New Neponset Valley Sewer construction.

Charles F. Fitz, Assistant Civil Engineer, in charge of maintenance studies and of maintenance construction work on the North Metropolitan System.

Benjamin Rubin, Assistant Civil Engineer, in charge of survey work and field work in connection with the Braintree-Weymouth Branch Sewer construction.

Richard S. Everit, Assistant Civil Engineer, in charge of survey work and field work in connection with the New Arlington Sewer.

Arthur F. F. Haskell, Superintendent, North Metropolitan Sewerage District.

Frank B. Williams, Superintendent, South Metropolitan Sewerage District.

In addition to the above, the maximum number of engineering and other assistants employed during the year was 40, which includes 5 assistant engineers, 10 instrumentmen, 1 supervising sewer construction inspector, 7 inspectors, 1 draftsman, 13 rodmen and engineering assistants, 1 chauffeur and 2 stenographers.

Metropolitan Sewerage Districts

AREAS AND POPULATIONS

During the year the town of Weymouth was added to the South Metropolitan Sewerage District.

The populations of the districts, as given in the following table, are based on the census of 1930.

Table showing Ultimate Contributing Areas and Present Estimated Populations within the Metropolitan Sewerage Districts, as of December 31, 1931.

CITY OR TOWN		Area (Square Miles)	Estimated Population	
North Metropolitan District	Arlington	5.20	39,450	
	Belmont	4.66	23,700	
	Boston (portions of)	3.45	93,700	
	Cambridge	6.11	114,740	
	Chelsea	2.24	46,720	
	Everett	3.34	50,320	
	Lexington ¹	5.11	5,910	
	Malden	5.07	60,340	
	Medford	8.35	63,520	
	Melrose	3.73	24,130	
	Reading	9.82	10,170	
	Revere	5.86	37,060	
	Somerville	3.96	105,910	
	Stoneham	5.50	10,320	
	Wakefield	7.65	16,670	
	Winchester	5.95	13,090	
	Winthrop	1.61	17,160	
	Woburn	12.71	19,640	
		100.32		752,550
South Metropolitan District	Boston (portions of)	24.96	377,750	
	Braintree	13.44	16,600	
	Brookline	6.81	49,610	
	Canton	17.84	5,820	
	Dedham ¹	9.40	14,400	
	Milton	12.59	17,630	
	Needham	12.50	11,410	
	Newton	16.88	68,620	
	Norwood	10.16	15,360	
	Quincy	12.56	75,620	
	Stoughton	16.23	8,330	
	Walpole	20.54	7,540	
	Waltham ²	13.63	42,180	
	Watertown	4.04	37,370	
	Wellesley	9.89	12,140	
	Weymouth	16.46	21,420	
		217.93		781,800
Totals		318.25		1,534,350

¹ Part of town.
² Including 1,650 in the Metropolitan State Hospital and the Middlesex County Tuberculosis Hospital, authorized by Chapter 372 of the Acts of 1928 and Chapter 373 of the Acts of 1929.

Metropolitan Sewers

SEWERS PURCHASED AND CONSTRUCTED AND THEIR CONNECTIONS

During the year there have been 7.291 miles of Metropolitan sewers built within the sewerage districts, so that there are now 135.907 miles of Metropolitan sewers. Of this total, 9.642 miles of sewers, with the Quncy Pumping Station, have been purchased from cities and towns of the districts. The remaining 126.265 miles of sewers and other works have been constructed by the Metropolitan Boards.

The locations, lengths and sizes of these sewers are given in the following tables, together with other data referring to the public and special connections with the systems:

NORTH METROPOLITAN SEWERAGE SYSTEM

Location, Length and Sizes of Sewers, with Public and Special Connections

CITY OR TOWN	Size of Sewers	Length in Miles	Public Con- nec- tions, Decem- ber 31, 1931	SPECIAL CONNECTIONS	
				Character or Location of Connection	Number in Operation
Boston:					
Deer Island .	4' 0" to 9' 0"	1.653	4	Doctor's House	1
East Boston	9' 0" to 1' 0"	5.467	25	Shoe factory	1
				Middlebrook Wool-combing Co.	1
Charlestown	6' 7" x 7' 5" to 1' 0" . .	3.292	15	Navy Yard	9
				Private building	1
				H. P. Hood & Sons, Inc. . .	1
Winthrop . .	9' 0"	2.864	14	Club House	1
				Fire department station . .	1
				Private building	1
				Bakery	1
				Rendering Works	1
Chelsea . . .	8' 4" x 9' 2" to 15" . . .	5.230	14	Metropolitan Water Works blow-off	1
				Chelsea Water Works blow- offs	2
				Naval Hospital	1
				U. S. Lighthouse Service . .	1
				Metropolitan Water Works blow-off	1
Everett . . .	8' 2" x 8' 10" to 4' 8" x 5' 1"	2.925	10	Cameron Appliance Co. . . .	1
				Shultz-Goodwin Co.	1
				Andrews-Wasgatt Co.	1
				National Metallic Bed Co. . .	1
				Linoide Co.	1
				Factory	2
				New England Structural Co. .	1
				Beacon Oil Co.	1
				Everett Factories and Terminal Corp.	1
Lexington ¹ .	1' 3"	-	1	-	-
				Metropolitan Water Works blow-offs	5
Malden . . .	4' 6" x 4' 10" to 1' 0" . .	5.844 ²	35	Private buildings	238 ³
				Factory	1
				Bakery	1
				Swift & Co.	1
				Holy Cross Cemetery office . .	1
Melrose . . .	4' 6" x 4' 10" to 10" . . .	6.099 ⁴	42	Private buildings	133 ⁵
				Factory	1
				Railroad station	1
				Park Department bath-house .	1
				Harvard dormitories	2
				Slaughterhouse	1
Cambridge . .	5' 2" x 5' 9" to 1' 3" . . .	7.899	53	City Hospital	3
				Street Railway machine shop .	1
				Private building	3
				Factory building	1
				Tannery	1
				Slaughterhouses (3)	1
				Carhouse	1
Somerville . .	6' 5" x 7' 2" to 10" . . .	3.577	16	Somerville Water Works blow- off	1
				Street railway power house . .	1
				Stable	1
				Rendering works	1
				Railroad scale pit	1
				Private building	1

¹ The Metropolitan Sewer extends but a few feet into the town of Lexington.

² Includes 1.84 miles of sewer purchased from the city of Malden.

³ Mostly buildings connected with sewers formerly belonging to city of Malden but later purchased by the Metropolitan Sewerage Commission in accordance with Chapter 215 of the Acts of 1898 and by the Metropolitan Water and Sewerage Board in accordance with Chapter 512 of the Acts of 1911 and made parts of the North Metropolitan Sewerage System.

⁴ Includes 0.736 of a mile of sewer purchased from the city of Melrose.

⁵ Mostly buildings connected with a sewer formerly belonging to the city of Melrose but later purchased by the Metropolitan Sewerage Commission in accordance with Chapter 414 of the Acts of 1896 and with a sewer extension built in accordance with Chapter 436 of the Acts of 1897 by the Metropolitan Sewerage Commission as an outlet for part of the town of Stoneham and made parts of the North Metropolitan Sewerage System.

NORTH METROPOLITAN SEWERAGE SYSTEM—Concluded

Location, Length and Sizes of Sewers, with Public and Special Connections—
Concluded

CITY OR TOWN	Size of Sewers	Length in Miles	Public Con- nec- tions, Decem- ber 31, 1931	SPECIAL CONNECTIONS	
				Character or Location of Connection	Number in Operation
Medford . . .	6' 0" x 6' 3" to 10" . . .	7.530	27	Armory building	1
				Private buildings	9
				Stable	1
				Police substation	1
				Tanneries	6
				Private buildings	12
				Gelatine factory	1
				Watch-hand factory	1
				Stable	1
Winchester . . .	4' 6" to 1' 3"	10.420	34	Railroad station	3
				Felt works	1
				Town Hall	1
				Bay State Saw & Tool Co.	1
				Whitney Machine Co.	1
				Metropolitan Sewerage Divi- sion	1
				Water and Sewer Department	1
				—	—
				—	—
Stoneham . . .	1' 8" to 10"	2.333	8	—	—
Woburn . . .	2' 6" x 2' 7" to 1' 3"	1.186	4	Glue factory	4
				Private building	1
				Private buildings	235 ²
				Railroad station	1
				Car house	3
				Post office	1
				Town of Arlington garage	1
				Town of Arlington workshop	1
				The Theodore Schwamb Co., Inc.	2
Arlington . . .	3' 0" x 3' 6" to 10"	5.846 ¹	64	Arlington Gas Light Co.	1
				Edison Transformer Station	1
				Arlington High School	1
				Laundry	1
				—	—
				—	—
				—	—
				—	—
				—	—
Belmont . . .	1' 3" to 2' 6"	0.008	5	—	—
Wakefield . . .	3' 0" to 2' 0" x 2' 3"	0.703	1	—	—
Revere . . .	4' 0" to 15"	0.136	3	—	—
Reading . . .	1' 4" to 3' 0"	0.055	1	—	—
		73.067 ³	376	733	

¹ Includes 2.631 miles of sewer purchased from the town of Arlington.

² Mostly buildings connected with a sewer formerly belonging to the town of Arlington but later purchased by the Metropolitan Sewerage Commission in accordance with Chapter 520 of the Acts of 1897 and made a part of the North Metropolitan Sewerage System.

³ Includes 2.787 miles of Mystic Valley Sewer in Medford and Winchester, running parallel with the Metropolitan Sewer.

SOUTH METROPOLITAN SEWERAGE SYSTEM

Location, Length and Sizes of Sewers, with Public and Special Connections

CITY OR TOWN	Size of Sewers	Length in Miles	Public Con- nec- tions, Decem- ber 31, 1931	SPECIAL CONNECTIONS	
				Character or Location of Connection	Number in Operation
Boston: Back Bay . . .	6' 6'' to 3' 9'' . . .	1.500 ¹	17	Tufts Medical School . . .	1
				Private house . . .	1
				Administration Building, Bos- ton Park Department . . .	1
				Simmons College Buildings . . .	1
				Art Museum . . .	2
				Prince District Elementary School . . .	1
				Private building . . .	2
				Abattoir . . .	3
				Boston & Albany Railroad yard . . .	2
Brighton . . .	7' 0'' to 12'' . . .	6.035 ²	16		

¹ Includes 0.355 of a mile of sewer purchased from the city of Boston.

² Includes 0.446 of a mile of pipe and concrete sewers built for the use of the city of Boston; also 0.026 of a mile of sewer purchased from the town of Watertown.

SOUTH METROPOLITAN SEWERAGE SYSTEM—*Concluded*
Location, Length and Sizes of Sewers, with Public and Special Connections
—*Concluded*

CITY OR TOWN	Size of Sewers	Length in Miles	Public Con- nections, Decem- ber 31, 1931	SPECIAL CONNECTIONS	
				Character or Location of Connection	Number in Operation
Dorchester	3' x 4' to 2' 6" x 2' 7"	2.870 ¹	14	Chocolate works Machine shop Paper Mill Private buildings Edison Electric Company Sta- tion	2 1 1 4 1
Hyde Park	10' 7" x 11' 7" to 4' 0" x 4' 1"	4.527	19	Mattapan Paper Mills Private buildings Fairview Cemetery buildings	2 2 1
Roxbury	6' 6" x 7' to 4' 0"	1.430	—	—	—
West Roxbury	9' 3" x 10' 2" to 12"	7.643	25	Caledonia Grove buildings Parental School Lutheran Evangelical Church The Whittemore Co. Private buildings	1 1 1 1 6
Brookline	6' 6" x 7' 0" to 8"	2.540 ²	14	Private buildings Private buildings	2 2
Dedham	4' x 4' 1" to 2' 9" x 3'	5.012	9	Private buildings Dedham Carpet Mills	2 1
Hull ³	60" pipe	0.750	—	—	—
Milton	11' x 12' to 8"	7.044	31	Private buildings	4
Newton	4' 2" x 4' 9" to 1' 3"	2.911	11	Private houses Laundry Metropolitan Water Works blow-off	16 1 1 1
Quincy	11' 3" x 12' 6" to 16" pipe	7.469	26	Squantum schoolhouse	1
Waltham	3' 6" x 4' 0"	0.001	1	—	—
Watertown	4' 2" x 4' 9" to 12"	0.750 ⁴	8	Private building Factories Stanley Motor Carriage Co. Knights of Pythias building Walker Gordon Co. Private buildings	2 2 1 1 2 6
Needham	2' 0" x 2' 3" to 2' 3" x 2' 6"	4.921	1	—	—
Wellesley ⁵	2' 0" x 2' 3"	—	1	—	—
Canton ⁶	4' 6" x 5' 0" to 2' 6" pipe	5.225	—	—	—
Norwood ⁶	4' 0" x 4' 3" to 2' 6" x 2' 9"	2.212	—	—	—
Stoughton ⁶	—	—	—	—	—
Walpole ⁶	—	—	—	—	—
Braintree ⁶	—	—	—	—	—
Weymouth ⁶	—	—	—	—	—
		62.840	193		80

¹ Includes 1.24 miles of sewer purchased from the city of Boston.
² Includes 0.158 of a mile of pipe sewer built for the use of the town of Brookline.
³ Hull is not a part of the Metropolitan Sewerage District.
⁴ Includes 0.025 of a mile of sewer purchased from the town of Watertown.
⁵ The Metropolitan Sewer extends but a few feet into the town of Wellesley.
⁶ No Metropolitan trunk sewer has been completed to give these towns an outlet.

Information relating to areas, populations, local sewer connections and other data for the Metropolitan sewerage districts appears in the following table:

North Metropolitan Sewerage District

Area (Square Miles)	Estimated Total Population	Miles of Local Sewer Connected	Estimated Population Contributing Sewage	Ratio of Contributing Population to Total Population (Per Cent)	CONNECTIONS MADE WITH METROPOLITAN SEWERS	
					Public	Special
100.32	752,550	963.88	700,330	93.1	376	733

South Metropolitan Sewerage District

217.93	781,800	947.68	563,780	72.1	193	80
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Both Metropolitan Sewerage Districts

318.25	1,534,350	1,911.56	1,264,110	82.4	569	813
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Of the estimated gross population of 1,534,350 on December 31, 1931, 1,264,110 representing 82.4 per cent, were on that date contributing sewage to the Metropolitan sewers, through a total length of 1,911.56 miles of local sewers owned by the individual cities and towns of the districts.

These sewers are connected with the Metropolitan Systems by 569 public and 813 special connections. During the current year there has been an increase of 35.56 miles of local sewers connected with the Metropolitan Systems, and 12 public and 9 special connections have been added.

CONSTRUCTION

North Metropolitan Sewerage System

RELOCATION OF OLD MYSTIC VALLEY SEWER

At the time of the construction of what is known as the Old Mystic Valley Sewer by the City of Boston through Winchester, a crossing was made over the Aberjona River near Wedgemere Station of the Boston and Maine Railroad by means of an iron pipe extending above the surface of the river. This was removed some years ago at the request of the citizens of Winchester and the sewage was turned at that time into the so-called Metropolitan Sewer. In order to make use of the Old Mystic Valley Sewer below Wedgemere, a contract was let to construct a siphon extending under the Aberjona River at this point consisting of 20-inch cast-iron pipe surrounded by concrete. This work was let out by contract, some particulars of which are as follows:

Date of Contract No. 49, (Sewerage Division) June 20, 1931.

Name of Contractor, George M. Bryne.

Length of Section, 100 feet.

Dimensions of siphon, 20-inch pipe.

Depth of excavation below river surface, 8 feet.

Engineer in immediate charge of the work, Arthur F. F. Haskell.

This work was completed and the siphon put in operation August 25, 1931, and the sewage flow above Wedgemere in the Old Mystic Valley Sewer was restored to its original route.

EXTENSION OF MILL BROOK VALLEY SEWER IN ARLINGTON

The Legislature, by Chapter 381 of the Acts of 1931, authorized the extension of the Metropolitan Sewer in Mill or Sucker Brook Valley from a point in Forest Street in Arlington to Park Avenue, Arlington. Surveys have been completed and borings made and a contract let for the construction of this work known as Section 82, North Metropolitan System. Some particulars of this contract are as follows:

Date of Contract No. 55, (Sewerage Division) December 23, 1931.

Name of Contractor, N. Cibotti Company.

Length of Section, 2,126 feet.

Dimensions of vitrified pipe sewer, 20-inch.

Depth of excavation, from 4 feet to 17 feet.

Assistant Engineer in immediate charge of the section, Richard S. Everit.

No work has been done under this contract to date.

South Metropolitan Sewerage System

NEW NEPONSET VALLEY SEWER

Work has been continued during the year in the matter of surveys and borings.

Contracts for the construction of Sections 109 (Part of), 110 (Part of), 111, 112, 113, 115 and 116 have been completed during the year excepting a small amount of backfilling and other work on Section 109 (Part of) and Section 110 (Part of).

NEW NEPONSET VALLEY SEWER—SECTION 114

This section was let in 1930. Work was continued on it during the year excepting for such periods as the Neponset Meadows were flooded so as to render work impractical. At the present time there have been completed 4,405 feet of sewer. This work will be completed during the early part of 1932.

NEW NEPONSET VALLEY SEWER—REMAINING SECTIONS

Contracts have been let during this year for the construction of Sections 117, 118, 119 and 120.

NEW NEPONSET VALLEY SEWER—SECTION 117

Date of Contract No. 46, (Sewerage Division) March 26, 1931.

Name of Contractor, J. F. Fitzgerald Construction Company.

Length of Section, 5,735 feet.

Dimensions of concrete sewer, 4 feet 0 inches by 4 feet 3 inches.

Depth of excavation, from 6 feet to 27 feet.

Length of 36-inch cast-iron siphon, 78 feet.

Assistant Engineer in immediate charge of the section, Seth Peterson.

At the present time there have been completed 4,881 feet of sewer. No unexpected difficulties have arisen. Considerable rock excavation was encountered.

NEW NEPONSET VALLEY SEWER—SECTION 118

Date of Contract No. 50, (Sewerage Division) August 6, 1931.

Name of Contractor, C. & R. Construction Company.

Length of Section, 4,935 feet.

Dimensions of concrete sewer, 36 inches by 39 inches and 30 inches by 33 inches.

Depth of excavation, from 5 feet to 32 feet.

Assistant Engineer in immediate charge of the section, Seth Peterson.

At the present time there have been completed 2,450 feet of sewer.

NEW NEPONSET VALLEY SEWER—SECTION 119

Date of Contract No. 47, (Sewerage Division) March 26, 1931.

Name of Contractor, Frank W. Christy.

Length of Section, 3,580 feet.

Dimensions of concrete sewer, 24 inches by 27 inches and 33 inches by 36 inches.

Depth of excavation, from 7 feet to 43 feet.

Assistant Engineer in immediate charge of the section, Seth Peterson.

At the present time there have been completed 3,093 feet of sewer.

NEW NEPONSET VALLEY SEWER—SECTION 120

Date of Contract No. 54, (Sewerage Division) December 10, 1931.

Name of Contractor, Anthony Baruffaldi.

Length of Section, total 3,300 feet.

Length in tunnel, 600 feet.

Length in trench, 2,700 feet.

Dimensions of concrete sewer, 27 inches by 36 inches.

Depth of excavation in trench, from 5 feet to 22 feet.

Depth below surface of tunnel, 66 feet.

Assistant Engineer in immediate charge of the section, Seth Peterson.

At the present time there have been completed 5 feet of sewer.

NEW NEPONSET VALLEY SEWER—SECTION 121

This section extends from Washington Street in Canton to the Stoughton-Canton boundary line. Owing to a study made by the Norfolk

County Commissioners and the Town of Canton for the layout of a new boulevard in this part of Canton, which would be a convenient and economical location for the sewer, there has been some delay in the awarding of this contract. This matter has now been practically settled and this contract will be awarded early in the coming year.

BRAINTREE-WEYMOUTH BRANCH

Surveys and boring studies have been made for the location of this trunk line which will extend from a point near the Metropolitan High-level Sewer in the vicinity of Palmer Street, Quincy, across private lands and across Fore River to Hunt's Point in Weymouth and from there through private lands and across Bridge Street in Weymouth to a point in Fore River Basin, thence crossing said Basin to a point near Idlewell, then extending through the Idlewell District and again crossing Fore River terminating in Braintree near Audubon Avenue. This new extension has been divided into four sections numbered 122, 123, 124 and 125. This work will also include the construction of a pumping station near the Metropolitan High-level Sewer in Quincy.

Section 125 of this branch has been placed under contract, some particulars of which are as follows.

BRAINTREE-WEYMOUTH BRANCH—SECTION 125

Date of Contract No. 52, (Sewerage Division) November 5, 1931.

Name of Contractor, George M. Bryne.

Length of Section, 3,620 feet.

Length of 30-inch cast-iron siphon, 735 feet.

Length of 42-inch cast-iron siphon, 1,565 feet.

Length of 48-inch by 51-inch concrete sewer, 1,320 feet.

Depth of excavation in trench, from 8 feet to 11 feet.

Depth of excavation for 30-inch siphon below low water, 22 feet.

Assistant Engineer in immediate charge of the section, Benjamin Rubin.

But little work has been done under this contract up to the present time.

SQUANTUM PUMPING STATION—QUINCY

Under the authorization of Chapter 240 of the Acts of 1928, the Commission has undertaken the construction of a pumping station at Newland Street, Squantum. A contract for the sub-structure of this station was let, some particulars of which are as follows:

Date of Contract No. 51, (Sewerage Division) August 24, 1931.

Name of Contractor, A. D. Daddario.

Dimensions of Reservoir, 36 feet by 96 feet.

Depth of excavation, 28 feet.

Length of 16-inch cast-iron force main, 460 feet.

Length of concrete sewer, 110 feet.

Dimensions of concrete sewer, 24 inches by 30 inches.

Work on this contract is about three-fourths completed.

PUMPING UNITS FOR SQUANTUM PUMPING STATION

A contract was let for the furnishing of motor driven centrifugal pumping units for this station, some particulars of which are as follows:

Date of Contract No. 53, (Sewerage Division) December 10, 1931.

Name of Contractor, Turbine Equipment Company of New England.

Two motors, 60 HP capacity each.

Two centrifugal pumps, suction 10 inches, discharge 8 inches.

Capacity of units, 4,000,000 gallons per day each with a dynamic lift of 46 feet.

This equipment is now being constructed.

Sewage from this station will be discharged into the old Quincy 24-inch force main which is connected with the City of Boston System at Squantum Head and will be discharged through the Moon Island Channels.

MAINTENANCE

SCOPE OF WORK AND FORCE EMPLOYED

The maintenance of the Metropolitan Sewerage System includes the operation of 8 pumping stations, the Nut Island screen-house and 135.907 miles of Metropolitan sewers, receiving the discharge from 1,911.56 miles of town and city sewers at 1,382 points, together with the care and study of inverted siphons under streams and in the harbor.

At present the permanent maintenance force consists of 188 men, of whom 117 are employed on the North System and 71 on the South System. These are subdivided as follows: North Metropolitan System, 74 engineers and other employees in the pumping stations and 43 men, including foremen, on maintenance, care of sewer lines, buildings and grounds; South Metropolitan System, 46 engineers and other employees in the pumping stations and 25 men, including foremen, on maintenance, care of sewer lines, buildings and grounds.

The regular work of this department, in addition to the operation of the pumping stations, has consisted of routine work of cleaning and inspecting sewers and siphons, caring for tide gates, outfall sewers, regulators and overflows, measuring flow in sewers, inspection of connections to the Metropolitan sewers, and the care of pumping stations and other buildings, grounds and wharves.

In addition to these regular duties, other work has been done by the maintenance employees in this department as follows:—

EAST BOSTON PUMPING STATION

The discharge pipe from the condensers of engines No. 3 and 4 was no longer able to carry away properly the water necessary for condensation. A new cast-iron flanged pipe 12 inches in diameter was laid in trenches cut through the foundation walls of the station building in order to relieve the situation. This work was done by the maintenance employees.

On the north chimney of this station, the lightning rod points had become so badly corroded that they no longer served their purpose. New points were placed in position with some new cable and fasteners. The cast-iron cap was removed and scraped and painted and rebedded in cement. This work was done by a chimney specialist.

The six boilers at this station were installed in 1908. The tubes at the water line had become very much corroded and began to fail. An arrangement was made with the Bethlehem Shipbuilding Company, Ltd., to retube one and with the Hodge Boiler Works to retube the remainder of these boilers. At the present time this work is over one-half completed.

The two economizers at this station were installed in 1908. They had become so weakened by rust that repairs were frequently necessary. Experts were asked to give estimated costs of removing these old economizers and furnishing and installing new ones. The Green Fuel Economizer Company were the low estimators and an arrangement was made with them whereby they were to remove the old and furnish and install new ones. At the present time this work is about one-half completed.

DEER ISLAND PUMPING STATION

During a thunder storm in June, one of the chimneys on the dwelling house used in connection with this station was struck by lightning and shattered. The slate roof was damaged. A new chimney was built and the roof repaired.

The 60-inch cast-iron check valve at this station broke in service. It was necessary to replace the original seat and hinge with a new bronze casting and to install a new disc.

The dwelling house on Deer Island was painted externally and the stockhouse roof was covered with asphalt shingles and the trimmings of the building were painted. All the above work was done by the maintenance employees.

The lightning rods on the chimney at this station were examined and found to need repairs. These consisted of furnishing and placing new points with new fasteners and some new cable; also the cast-iron cap on the chimney was removed, scraped, painted and rebbed in cement. Considerable pointing was done on the chimney. This work was done by a chimney specialist.

HARVARD COLLEGE SERVICE TUNNEL

Harvard College Corporation built a tunnel for passage purposes to connect the Smith Building with the new Library Building in Cambridge. This crossed the Metropolitan sewer at Station 6A+7 to Station 6A+25 of Section 30 as relocated. In order not to disturb the tunnel, a short section of Metropolitan sewer was built on the north side of the existing Metropolitan sewer by and at the expense of Harvard College for future use if the Metropolitan sewer should be duplicated.

RAILROAD CROSSING IN CAMBRIDGE

The Concord Avenue Realty Company desired to construct a branch railroad across the Metropolitan Sewer at about Station 93+30 to Station 93+50 of Section 43 of the Metropolitan sewer in Cambridge. The sewer structure at this point was not strong enough to withstand such use and was strengthened by reinforced concrete surrounding the sewer structure. This work was done by a contractor at the expense of the Realty Company.

WARD STREET PUMPING STATION

Boilers Nos. 5 and 6 at this station were installed in 1918. It was found necessary to remove the staybolts and install new ones. This was done by the International Engineering Works, Incorporated, of Framingham, who were the lowest bidders.

At this station sewage is used for condensing purposes. The discharge pipes leading from the barometric condensers had become too small to successfully fulfill their purpose. A new 16-inch cast-iron flanged pipe was extended through the 7-foot-thick foundation wall of this building and connected with the discharge from the condensers and extended to a point in the suction tube of Pump No. 1 of this station. This pipe now is used in addition to the original installation. This work was done by the maintenance employees.

Vertical boilers Nos. 1 and 2 at this station were installed in 1904. It was found necessary to replace these. The D. M. Dillon Steam Boiler Works of Fitchburg were the lowest bidders on the removal of the old boilers and the furnishing and placing of new boilers. These new boilers are of the corrugated furnace type thus doing away with staybolts. These were put in operation November 23, 1931. There are now at this station four internally fired vertical boilers of corrugated furnace type and two similar boilers with staybolt construction.

HOUGH'S NECK PUMPING STATION

At this station two 6-inch Lawrence centrifugal pumps were installed in 1910. These had become so badly worn and corroded that repairs were no longer practical. These pumps were replaced by two of exactly

similar size and type furnished by the Lawrence Pump and Engine Company who furnished the original ones. This work was done by the maintenance employees.

NUT ISLAND SCREEN-HOUSE

In addition to the regular maintenance work at this station and at the Hough's Neck Pumping Station, the employees of this station have made 4,117 lbs. of brass castings for the different pumping stations of the Sewerage Systems. A large amount of expert machine work has been done here for other stations.

DAMAGE BY STORM

A heavy storm caused the tide to destroy about fifty feet of the way known as Pawsey Road in Quincy. This road is by agreement under the care and upkeep of the Metropolitan District Commission. Repairs were made by the maintenance employees.

GASOLENE IN PUBLIC SEWERS

During the year the usual precautions have been maintained against the introduction of gasoline into the Metropolitan sewers. An inspector who covers both North and South Metropolitan Sewerage Districts has been employed. His duties are to see that all newly constructed garages or other gasoline-using establishments are supplied with a proper gasoline separator and also to see that these separators are kept in working condition.

During the year 1931 the number of permits issued by the municipalities in the Sewerage Districts for the construction of garages and other places where gasoline is used was 290. Each of these permits necessitates an examination by our inspector. Many of them are attended to through the mails and do not require a personal visit. Visits are made, however, to all locations where a connection is to be made with the public sewerage system and to such places as do not respond to the return postal cards sent out. During the year 28 such places were connected with the sewers that empty into the Metropolitan Systems. At the present time, there are, according to our records, 1,611 garages and other establishments where gasoline is used connected with the local sewerage systems which discharge into the Metropolitan sewers.

This system of inspection has improved the gasoline situation in regard to the danger to the sewers. Occasionally odors of gasoline are detected in the sewers. These are reported to the Public Safety Department which alone has statutory control of the distribution and handling of gasoline in the Commonwealth.

NORTH METROPOLITAN SEWERAGE SYSTEM

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

[Populations estimated as of December 31, 1931]

CITIES AND TOWNS	Miles of Local Sewers Connected	Separate or Combined	Number of Connections with Local Sewers	Estimated Number of Persons Served by Each House Connection ¹	Estimated Population Now Contributing Sewage	Estimated Present Total Population	Estimated Area Now Contributing Sewage	Area Ultimately to Contribute to Sewage	Ratio of Contributing Population to Present Total Population	Ratio of Contributing Area to Ultimate Area
							Sq. Miles	Sq. Miles	Per Cent.	Per Cent.
Boston (Deer Island)	0.70	Separate	-	-	890 ²	890	-	-	-	-
Winthrop	33.30	Separate	3,824	4.40	16,830	17,160	1.41	1.61	98.1	87.6
Boston (East Boston)	34.80	Separate and combined	5,484	10.60	58,130	60,810	1.21	2.18	95.6	55.5
Chelsea	32.88	Separate and combined	4,834	9.50	45,920	46,720	1.22	2.24	98.3	54.5
Everett	53.46	Separate and combined	6,654	7.40	49,240	50,320	2.15	3.34	97.9	64.4
Malden	77.79	Separate	9,405	6.25	58,780	60,340	3.44	5.07	97.4	67.9
Melrose	50.15	Separate	4,952	4.60	22,780	24,130	2.24	3.73	94.4	60.1
Boston (Charlestown)	22.01	Separate and combined	5,603	5.65	31,660	32,000	0.67	1.27	98.9	52.8
Cambridge	164.74	Separate and combined	19,079	6.00	114,470	114,740	5.17	6.11	99.8	84.6
Somerville	106.41	Separate and combined	17,915	5.85	104,800	105,910	3.67	3.96	99.0	92.7
Medford	92.01	Separate	10,423	6.00	62,540	63,520	4.27	8.35	98.5	51.1
Winchester	42.61	Separate	2,905	4.45	12,930	13,090	2.01	5.95	98.8	33.8
Woburn	23.12	Separate	1,692	5.60	9,480	19,640	1.19	12.71	48.3	9.4
Stoneham	18.53	Separate	1,482	4.50	6,670	10,320	0.97	5.50	64.6	17.6
Arlington	60.25	Separate	5,931	5.80	34,400	39,450	2.85	5.20	87.2	54.8
Belmont	44.86	Separate	3,347	6.50	22,400 ³	23,700	2.12	4.66	94.5	45.5
Wakefield	25.95	Separate	1,642	5.10	8,370	16,670	1.09	7.65	50.2	14.2
Lexington	16.31	Separate	681	3.80	2,590 ⁴	5,910	0.93	5.11	43.8	18.2
Revere	52.97	Separate	5,285	6.70	35,410	37,060	2.49	5.86	95.5	42.5
Reading	11.03	Separate	497	4.10	2,040	10,170	0.53	9.82	20.1	5.4
Totals	963.88	- - - - -	111,635	6.30	700,330	752,550	39.63	100.32	93.1	39.5

¹ Estimated from Assessors' statement of the number of houses in each city or town on April 1, 1931, and the population from census of 1930.

² Estimated by Superintendent of the Institution on Deer Island.

³ Including 2 connections with McLean Hospital, having an estimated population of 642.

⁴ Part of town not included in Metropolitan Sewerage District.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

[Populations estimated as of December 31, 1931]

CITIES AND TOWNS	Miles of Local Sewers Connected	Separate or Combined	Number of Connections with Local Sewers	Estimated Number of Persons Served by Each House Connection ¹	Estimated Population Now Contributing Sewage	Estimated Present Total Population	Estimated Area Now Contributing Sewage Sq. Miles	Area Ultimately to Contribute to Sewage Sq. Miles	Ratio of Contributing Population to Present Total Population Per Cent.	Ratio of Contributing Area to Ultimate Area Per Cent.
Boston (Back Bay)	27.83	Separate and combined	2,233	19.35	43,210	43,450	1.17	1.61	99.4	72.7
Boston (Brighton)	74.08	Separate and combined	5,955	9.95	59,250	59,500	3.38	3.74	99.6	90.4
Brookline	92.48	Separate and combined	7,069	6.95	49,130	49,610	4.19	6.81	99.0	61.5
Newton	178.01	Separate	12,638	5.30	66,980	68,620	9.19	16.88	97.6	54.4
Watertown	66.07	Separate	5,978	6.10	36,470	37,370	2.90	4.04	97.6	71.8
Waltham	62.59 ⁸	Separate	5,170	7.70	41,460 ⁷	42,180 ⁷	3.45	13.63	98.3	25.3
Boston (Dorchester)	72.91	Separate and combined	8,281	10.50	86,950 ²	124,600 ²	2.94	4.89	69.8	60.1
Milton	31.82	Separate and combined	2,489	4.60	11,450 ²	17,630 ²	1.39	12.59	64.9	11.0
Boston (Hyde Park)	43.51	Separate	3,413	7.95	27,130	27,500	1.95	4.57	98.7	42.7
Dedham	22.21	Separate	1,405	4.80	6,740	14,400 ³	1.07	9.40	46.8	11.4
Boston (Roxbury) ⁴	—	—	—	—	—	52,000 ²	—	1.23	—	—
Boston (West Roxbury)	92.79	Separate and combined	7,445	6.90	54,020 ^{2,5}	70,700 ²	3.73	8.92	76.4	41.8
Quincy	133.14	Separate	12,412	5.90	73,230	75,620	5.13	12.56	96.8	40.8
Wellesley	35.79	Separate	1,508	4.00	6,030	12,140	2.05	9.89	49.7	20.7
Needham	14.45	Separate	433	4.00	1,730	11,410	0.69	12.50	15.2	5.5
Canton ⁶	—	—	—	—	—	5,820	—	17.84	—	—
Norwood ⁶	—	—	—	—	—	15,360	—	10.16	—	—
Stoughton ⁶	—	—	—	—	—	8,330	—	16.23	—	—
Walpole ⁶	—	—	—	—	—	7,540	—	20.54	—	—
Braintree ⁶	—	—	—	—	—	16,600	—	13.44	—	—
Weymouth ⁶	—	—	—	—	—	21,420	—	16.46	—	—
Totals	947.68	—	76,429	7.40	563,780	781,800	43.23	217.93	72.1	19.8

¹ Estimated from Assessors' statement of the number of houses in each city or town on April 1, 1931, and the population from census of 1930.

² Parts of Dorchester, Milton, Roxbury and West Roxbury which are situated within the South Metropolitan Sewerage System limits are tributary at present to Boston main drainage works.

³ Part of town not included in Metropolitan Sewerage District.

⁴ At present connected with Boston main drainage system.

⁵ Including connection with institution at Austin Farm, having an estimated population of 2,645.

⁶ No Metropolitan trunk sewer has been completed to give these towns an outlet.

⁷ Including connections with the Metropolitan State Hospital and the Middlesex County Tuberculosis Hospital authorized, by chapter 372 of the Acts of 1928 and chapter 373 of Acts of 1929, having an estimated population of 1,650.

⁸ Includes 3.65 miles of trunk sewer built by Waltham for the joint use of Waltham, Watertown, Metropolitan State Hospital and Middlesex County Tuberculosis Hospital, authorized by Chapter 372 of the Acts of 1928 and Chapter 373 of the Acts of 1929.

BOTH METROPOLITAN SEWERAGE SYSTEMS

Table showing Areas delivering Sewage to both Systems; Approximate Miles of Sewers connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas. Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

[Population estimated as of December 31, 1931]

SYSTEMS	Miles of Local Sewers Connected	Separate or Combined	Number of Connections with Local Sewers	Estimated Number of Persons Served by Each House Connection	Estimated Population Now Contributing Sewage	Estimated Present Total Population	Estimated Area Now Contributing Sewage	Area Ultimately to Contribute to Sewage	Ratio of Contributing Population to Present Total Population	Ratio of Contributing Area to Ultimate Area
North Metropolitan	963.88	Separate and combined	111,635	6.3	700,330	752,550	Sq. Miles 39.63	Sq. Miles 100.32	Per Cent. 93.1	Per Cent. 39.5
South Metropolitan	947.68	Separate and combined	76,429	7.4	563,780	781,800	Sq. Miles 43.23	Sq. Miles 217.93	Per Cent. 72.1	Per Cent. 19.8
Totals	1,911.56	- - -	188,064	6.7	1,264,110	1,534,350	82.86	318.25	82.4	26.0

PUMPING STATIONS
CAPACITIES AND RESULTS
NORTH METROPOLITAN SYSTEM
Deer Island Pumping Station

At this station are four submerged centrifugal pumps with impeller wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 100,000,000 gallons, with 19-foot lift.

Contract capacity of 3 pumps: 45,000,000 gallons each, with 19-foot lift.

Average coal duty for the year: 51,000,000 foot pounds.

Average quantity raised each day: 84,200,000 gallons.

Maximum quantity raised per day: 154,700,000 gallons.

East Boston Pumping Station

At this station are four submerged centrifugal pumps, with impeller wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 100,000,000 gallons with 19-foot lift.

Contract capacity of 3 pumps: 45,000,000 gallons each, with 19-foot lift.

Average coal duty for the year: 64,500,000 foot pounds.

Average quantity raised each day: 82,200,000 gallons.

Maximum quantity raised per day: 152,700,000 gallons.

Charlestown Pumping Station

At this station are three submerged centrifugal pumps, two of them having impeller wheels 7.5 ft in diameter, the other 8.25 feet in diameter. They are driven by triple-expansion engines of the Reynolds-Corliss type.

Contract capacity of 1 pump: 60,000,000 gallons with 8-foot lift.

Contract capacity of 2 pumps: 22,000,000 gallons each, with 11-foot lift.

Average coal duty for the year: 46,500,000 foot pounds.

Average quantity raised each day: 47,200,000 gallons.

Maximum quantity raised per day: 76,000,000 gallons.

Alewife Brook Pumping Station

The pumping units in this station consist of one Andrews pump driven by a compound marine engine, one Morris pump and Morris compound engine and a specially designed engine of vertical cross-compound type having between the cylinders a centrifugal pump rotating on a horizontal axis.

Contract capacity of the Andrews pump: 4,500,000 gallons with 13-foot lift.

Contract capacity of Morris pump: 8,000,000 gallons with 15-foot lift.

Contract capacity of the special pump: 13,000,000 gallons with 13-foot lift.

Average coal duty for the year: 23,400,000 foot pounds.

Average quantity raised each day: 7,070,000 gallons.

Maximum quantity raised per day: 18,950,000 gallons.

Reading Pumping Station

At this station are two submerged centrifugal pumps, one of 2,500,000 gallons per 24 hours, and one of 4,000,000 gallons per 24 hours capacity. These operate against a maximum head of 65 feet, and are actuated by vertical shafts directly connected with 75 and 100 horse-power motors. Alternating current of 440 volts furnished by the town of Reading is used.

Average quantity pumped per 24 hours: 985,000 gallons.

Maximum quantity raised per day: 2,080,000 gallons.

SOUTH METROPOLITAN SYSTEM

Ward Street Pumping Station

At this station are two vertical, triple-expansion pumping engines, of the Allis-Chalmers type, operating reciprocating pumps, the plungers of which are 48 inches in diameter with a 60-inch stroke and one 50,000,000-gallon centrifugal pumping unit actuated by a 500 H.P. Uniflow engine.

Contract capacity of 3 pumps: 50,000,000 gallons each, with 45-foot lift.
Average coal duty for the year: 83,300,000 foot pounds.
Average quantity raised each day: 38,600,000 gallons.
Maximum quantity raised per day: 64,000,000 gallons.

Quincy Pumping Station

The plant at this station consists of one compound condensing Deane duplex piston pumping unit and one Lawrence centrifugal pump driven by a Sturtevant compound condensing engine and one Morris centrifugal pump driven by a Morris compound condensing engine.

Contract capacity of 3 pumps: Morris centrifugal, 10,000,000 gallons; Deane, 5,000,000 gallons; Lawrence centrifugal, 10,000,000 gallons.
Average coal duty for the year: 34,100,000 foot pounds.
Average quantity raised each day: 7,970,000 gallons.
Maximum quantity raised per day: 25,210,000 gallons.

Nut Island Screen-house

The plant at this house includes two sets of screens in duplicate actuated by small reversing engines of the Fitchburg type. Two vertical Deane boilers, 80 horse-power each, operate the engines, provide heat and light for the house, burn materials intercepted at the screens, and furnish power for the Hough's Neck pumping station.

Average daily quantity of sewage passing screens: 76,300,000 gallons.
Maximum quantity passing screens per day: 220,500,000 gallons.

Hough's Neck Pumping Station

At this station are two 6-inch submerged Lawrence centrifugal pumps with vertical shafts actuated by two Sturtevant direct-current motors.

The labor and electric energy for this station are supplied from the Nut Island Screen-house, and as used at present it does not materially increase the amount of coal used at the latter station.

Average quantity raised each day: 276,000 gallons.
Maximum quantity raised per day: 581,000 gallons.

Average Daily Volume of Sewage lifted at Each of the Eight Metropolitan Sewerage Pumping Stations during the Year, as compared with the Corresponding Volumes for the Previous Year

PUMPING STATION	AVERAGE DAILY PUMPAGE			
	Jan. 1, 1931, to Dec. 31, 1931	Jan. 1, 1930, to Dec. 31, 1930	Increase during the Year	
	Gallons	Gallons	Gallons	Per Cent.
Deer Island	84,200,000	77,100,000	7,100,000	9.21
East Boston	82,200,000	75,100,000	7,100,000	9.45
Charlestown	47,200,000	41,100,000	6,100,000	14.84
Alewife Brook	7,070,000	5,480,000	1,590,000	29.01
Reading	985,000	828,000	157,000	18.96
Quincy	7,970,000	5,900,000	2,070,000	35.08
Ward Street (actual gallons pumped)	38,600,000	33,500,000	5,100,000	15.22
Hough's Neck	276,000	222,000	54,000	24.32

METROPOLITAN SEWERAGE OUTFALLS

The Metropolitan Sewerage Districts now have outfalls in Boston Harbor at five points, two of which may discharge sewage from the North District and three from the South District.

During the year the sewage of the North District has been discharged wholly through the outlet located near Deer Island light. The other outfall of this system is closed by a cast-iron cover which can easily be removed.

Of the outfalls of the South District two extend for a distance exceeding one mile from the shore of Nut Island, Quincy, and the third one, called an emergency outlet, extends about 1,500 feet from the same. It was necessary to discharge sewage through this outfall 175 hours during the year.

During the year the average flow through the North Metropolitan District outfall at Deer Island has been 84,200,000 gallons of sewage per 24 hours, with a maximum rate of 154,700,000 gallons during a stormy period in June, 1931. The amount of sewage discharged into the North Metropolitan District averaged 120 gallons per day for each person, taking the estimated population of the District contributing sewage. If the sewers in this District were restricted to the admission of sewage proper only, this per capita amount would be considerably decreased.

In the South Metropolitan District an average of 76,300,000 gallons of sewage per 24 hours has passed through the screens at the Nut Island Screen-house and has been discharged from the outfalls into the outer harbor. The maximum rate of discharge per day which occurred during a stormy period in June, 1931 was 220,500,000 gallons. The discharge of sewage through these outfalls represents the amount of sewage contributed by the South Metropolitan District, which was at the rate of 135 gallons per day per person of the estimated number contributing sewage in the District.

The daily discharge of sewage per capita is larger in the South District than it is in the North District because, owing to the large size and unused capacity of the South District High-Level Sewer, more storm water is at present admitted to the sewers of this District.

MATERIAL INTERCEPTED AT THE SCREENS

The material removed from the sewage at the screens of the North Metropolitan Sewerage Stations, consisting of rags, paper and other floating materials, has during the year amounted to 1,958 cubic yards. This is equivalent to 1.72 cubic feet for each million gallons of sewage pumped at Deer Island.

The material removed from the sewage at the screens of the South Metropolitan Sewerage Stations amounted to 4,713 cubic yards, equal to 4.57 cubic feet per million gallons of sewage delivered at the outfall works at Nut Island.

Studies of sewage flows in the Metropolitan sewers and siphons indicate that they are free from deposit.

FREDERICK D. SMITH,

Director and Chief Engineer of Sewerage Division.

Boston, January 1, 1932.

Expenditures

CHARLES RIVER BASIN CONSTRUCTION FUND

Total amount authorized to Dec. 1, 1930	\$4,500,000 00
Receipts to Dec. 1, 1930	9,368 91
	<hr/>
	\$4,509,368 91
<i>Expenditures</i>	
Amounts charged to Nov. 30, 1931	4,472,922 22
	<hr/>
Balance, Dec. 1, 1931	\$36,446 69

NORTHERN TRAFFIC ROUTE CONSTRUCTION FUND

Total amount authorized to Dec. 1, 1930	\$3,000,000 00
Receipts trans. from Northern Traffic Artery Betterment Assessments and Sales Fund	18,140 30
	<hr/>
	\$3,018,140 30
<i>Expenditures</i>	
Land	\$15,904 17
Legal services	31 97
Abatement of betterment assessments	93 92
	<hr/>
	\$16,030 06
Amounts charged to Nov. 30, 1930	2,926,046 46
	<hr/>
	2,942,076 52
	<hr/>
Balance, Dec. 1, 1931	\$76,063 78

NEWTON-WELLESLEY BRIDGE CONSTRUCTION FUND

Total amount authorized to Dec. 1, 1930	\$50,000 00
Receipts:	
For the year ending Nov. 30, 1931	\$29 81
For the period prior to Dec. 1, 1930	1,703 48
	<hr/>
	1,733 29
	<hr/>
	\$51,733 29
<i>Expenditures</i>	
Amounts charged to Nov. 30, 1931	50,000 00
	<hr/>
Balance, Dec. 1, 1931	\$1,733 29

CHARLES RIVER BASIN IMPROVEMENTS

Chapter 371, Acts of 1929	\$2,305,000 00
Less Chapter 179, Acts of 1931	25,000 00
	<hr/>
	\$2,280,000 00
<i>Expenditures</i>	
Dam to Cottage Farm Bridge:	
Construction:	
Contracts:	
Bay State Dredging and Contracting Co.	\$27,983 17
Trimount Dredging Co.	2,677 50
	<hr/>
	\$30,660 67
Labor and materials	96,018 00
	<hr/>
	\$126,678 67
Engineering:	
Services	\$13,478 44
Expenses	372 62
	<hr/>
	13,851 06
Legal:	
Services	\$158 55
Expenses	58 77
	<hr/>
	217 32
Appraising	6,075 00
Architect services	2,538 94
Other services	262 50
Advertising	123 75
Miscellaneous	99 50
Borings	1,781 94
	<hr/>
	\$151,628 68
Nonantum Road Extension:	
Construction:	
Contract, Thomas J. McCue	\$11,812 40
Labor and materials	616 44
	<hr/>
	\$12,428 84
Engineering:	
Services	\$3,268 29
Expenses	176 50
	<hr/>
	3,444 79
Land	33,150 00
Legal:	
Services	\$292 56
Expenses	24 25
	<hr/>
	316 81
Appraising	1,957 50
Advertising	62 40
Miscellaneous	90 84
	<hr/>
	51,451 18

Charles River Basin Improvements—Concluded

Underpass:			
Construction:			
Contract, Coleman Bros.	.	.	\$124,015 47
Labor and materials	.	.	1,482 29
			<u>\$125,497 76</u>
Engineering:			
Services	.	.	\$4,828 69
Expenses	.	.	494 58
			<u>5,323 27</u>
Other services	.	.	6,449 85
Advertising	.	.	54 40
			<u>\$137,325 28</u>
Abattoir:			
Engineering:			
Services	.	.	\$321 80
Expenses	.	.	90
			<u>\$322 70</u>
Legal services	.	.	76 60
Appraising	.	.	2,100 00
Miscellaneous	.	.	50 00
			<u>2,549 30</u>
Mt. Auburn Street:			
Engineering:			
Services	.	.	\$411 20
Expenses	.	.	11 40
			<u>422 60</u>
General:			
Architect services	.	.	\$2,120 26
Advertising	.	.	67 31
			<u>2,187 57</u>
			<u>\$345,564 61</u>
Amounts charged to Nov. 30, 1930	.	.	55,886 39
			<u>\$401,451 00</u>
Balance, Dec. 1, 1931	.	.	\$1,878,549 00

Miscellaneous

METROPOLITAN PARKS EXPENSE FUND

Receipts, Dec. 1, 1930, to Nov. 30, 1931:			
Bath Houses:			
Revere Beach:			
Sale of tickets	.	.	\$19,762 60
Privileges	.	.	396 00
Miscellaneous	.	.	22 55
			<u>\$20,181 15</u>
Nantasket Beach:			
Sale of tickets	.	.	\$22,167 55
Privileges	.	.	123 20
Steam furnished	.	.	4,244 02
Miscellaneous	.	.	23 00
			<u>26,557 77</u>
Nahant Beach:			
Sale of tickets	.	.	\$7,871 70
Privileges	.	.	109 00
Miscellaneous	.	.	58 42
			<u>8,039 12</u>
Magazine Beach:			
Sale of tickets	.	.	685 40
Blue Hills:			
Sale of tickets	.	.	\$475 30
Miscellaneous	.	.	3 00
			<u>478 30</u>
			<u>\$55,941 74</u>
Rentals:			
Buildings	.	.	\$53,716 66
Houses	.	.	1,667 00
Ducts	.	.	3,030 68
Land	.	.	2,567 00
			<u>60,981 34</u>
Sales:			
Land	.	.	\$10,570 00
Wood	.	.	2,431 02
Hay and grain	.	.	382 50
Old metal, lumber, etc.	.	.	331 93
Miscellaneous	.	.	419 98
			<u>14,135 43</u>
Court fines	.	.	22,143 25
Interest on investments	.	.	2,200 00
Interest on average daily balance	.	.	778 08
Privileges	.	.	6,786 24
Golf privileges	.	.	23,736 80
Sidewalk and entrance construction	.	.	3,472 25
Boat hire	.	.	1,168 15
Damage to property	.	.	1,109 33
Reimbursement for erecting fence	.	.	2,148 00
Reimbursement for construction of drain and resurfacing	.	.	1,367 30
Forfeited bids	.	.	613 00
Miscellaneous	.	.	597 18
			<u>\$197,178 09</u>
Receipts, prior to Dec. 1, 1930	.	.	3,692,336 06
			<u>\$3,889,514 15</u>

Metropolitan Parks Expense Fund—Continued

Expenditures, Dec. 1, 1930, to Nov. 30, 1931:

General Expense:					
Advertising	.	.	.	\$100 56	
Discount on securities	.	.	.	1,655 50	
Miscellaneous	.	.	.	20 00	
					\$1,776 06
Police:					
Damages to automobile	.	.	.	\$44 32	
Professional services	.	.	.	17 00	
Miscellaneous	.	.	.	91	
					62 23
Blue Hills Reservation:					
Repairs to houses	.	.	.	\$93 61	
Bath house expenses	.	.	.	82 70	
Damages to automobile	.	.	.	17 10	
					193 41
Stony Brook Reservation:					
Repairs to houses	.	.	.	.	3 85
Neponset River Reservation:					
Land	.	.	.	\$60 00	
Legal:					
Services	.	.	.	\$14 49	
Expenses	.	.	.	2 62	
				17 11	
					77 11
Blue Hills Parkway:					
Repairs to lamp pole	.	.	.	\$747 10	
Drainage:					
Construction:					
Contract, John P. Condon Corporation	.	.	.	\$6,780 34	
Labor and materials	.	.	.	2,470 54	
				\$9,250 88	
Engineering:					
Services	.	.	.	\$392 10	
Expenses	.	.	.	63 05	
				455 15	
				9,706 03	
					10,453 13
Furnace Brook Parkway:					
Sidewalk and entrance construction:					
Cost	.	.	.	\$2,829 33	
Refund	.	.	.	201 71	
				\$3,031 04	
Legal services	.	.	.	12 69	
					3,043 73
West Roxbury Parkway:					
Sidewalk and entrance construction:					
Cost	.	.	.	.	779 71
Middlesex Fells Reservation:					
Repairs to houses	.	.	.	\$574 25	
Shrubs	.	.	.	13 32	
Damage to automobile	.	.	.	2 50	
Professional services	.	.	.	14 00	
Sidewalk and entrance construction:					
Refund	.	.	.	2 26	
Miscellaneous	.	.	.	6 40	
					612 73
Middlesex Fells Parkway:					
Repairing ditches	.	.	.	\$ 187 50	
Appraising	.	.	.	50 00	
Legal services	.	.	.	26 16	
Sidewalk and entrance construction:					
Cost	.	.	.	\$612 43	
Refund	.	.	.	231 87	
				844 30	
					1,107 96
Mystic Valley Parkway:					
Sidewalk and entrance construction:					
Cost	.	.	.	\$202 84	
Refund	.	.	.	47 41	
					250 25
Lynn Fells Parkway:					
Legal services	.	.	.	\$15 34	
Sidewalk and entrance construction:					
Cost	.	.	.	\$1,133 36	
Refund	.	.	.	44 55	
				1,177 91	
					1,193 25
Middlesex Fells Roads:					
Sidewalk and entrance construction:					
Cost	.	.	.	.	75 02
Alewife Brook Parkway:					
Sidewalk and entrance construction:					
Cost	.	.	.	\$530 50	
Refund	.	.	.	36 92	
					567 42

Metropolitan Parks Expense Fund—Concluded

Revere Beach Reservation:			
Sidewalk and entrance construction:			
Refund		\$93 20	
Bath house:			
Payrolls	\$32,213 51		
Miscellaneous supplies and expenses	10,675 39		
		<u>42,888 90</u>	\$42,982 10
Winthrop Shore Reservation:			
Sidewalk and entrance construction:			
Cost		\$142 80	
Refund		66 70	
		<u>209 50</u>	
Revere Beach Parkway:			
Sidewalk and entrance construction:			
Cost	\$566 74		
Refund	340 47		
		<u>\$907 21</u>	
Legal services		9 41	
Drain:			
Engineering:			
Services	\$254 41		
Expenses	3 70		
		<u>\$258 11</u>	
Advertising		56 05	
		<u>314 16</u>	1,230 78
Nahant Beach Parkway:			
Advertising		\$96 87	
Repairs to roadside stand		47 45	
Bath house:			
Payrolls	\$8,602 10		
Miscellaneous supplies and expenses	1,163 99		
		<u>9,766 09</u>	9,910 41
Lynnway:			
Sidewalk and entrance construction:			
Cost		\$73 26	
Refund		76 74	
		<u>150 00</u>	
Charles River Upper Division:			
Damage to automobiles		\$338 38	
Sidewalk and entrance construction:			
Cost	\$200 85		
Refund	106 56		
		<u>307 41</u>	
Miscellaneous		4 17	649 96
Riverside Recreation Grounds:			
Piping			246 10
Riverside Public Golf Links:			
Miscellaneous supplies and expenses			26,194 41
Charles River Lower Basin:			
Advertising		\$46 50	
Magazine Beach Bath House:			
Payrolls	\$3,375 08		
Miscellaneous supplies and expenses	447 29		
		<u>3,822 37</u>	3,868 87
Cambridge Parkway:			
Filling			22,506 25
Alewife Brook Parkway:			
Sidewalk and entrance construction:			
Cost			334 61
Nantasket Beach Reservation:			
Repairs to buildings		\$791 22	
Bath house:			
Payrolls	\$16,792 06		
Miscellaneous supplies and expenses	4,003 82		
		<u>20,795 88</u>	21,587 10
Wellington Bridge:			
Repairs			230 50
		<u>\$150,296 45</u>	
Expenditures, prior to Dec. 1, 1930		3,609,033 27	\$3,759,329 72
Balance, Dec. 1, 1931			\$130,184 43

METROPOLITAN PARKS TRUST FUND

Receipts:			
For the year ending Nov. 30, 1931		\$137 64	
For the period prior to Dec. 1, 1930		41,342 50	
		<u>\$41,480 14</u>	
Expenditures:			
For the year ending Nov. 30, 1931		—	
For the period prior to Dec. 1, 1930		\$38,140 11	
		<u>38,140 11</u>	
Balance Dec. 1, 1931			\$3,340 03

EDWIN U. CURTIS MEMORIAL TRUST FUND

Receipts:			
For the year ending Nov. 30, 1931		\$71 15	
For the period prior to Dec. 1, 1930		1,591 72	
			\$1,662 87
Expenditures:			
For the year ending Nov. 30, 1931		\$193 74	
For the period prior to Dec. 1, 1930		43 85	
			237 59
Balance, Dec. 1, 1931			\$1,425 28

JOHN W. WEEKS BRIDGE TRUST FUND

Receipts:			
For the year ending Nov. 30, 1931		\$5 69	
For the period prior to Dec. 1, 1930		235,613 12	
			\$235,618 81
Expenditures:			
For the year ending Nov. 30, 1931		-	
For the period prior to Dec. 1, 1930		\$235,287 90	
			235,287 90
Balance, Dec. 1, 1931			\$330 91

GENERAL REVENUE, BUNKER HILL MONUMENT

Receipts:			
For the year ending Nov. 30, 1931		\$3,982 50	
For the period prior to Dec. 1, 1930		39,300 50	
			\$43,283 00

Maintenance

METROPOLITAN PARKS MAINTENANCE FUND, GENERAL

Appropriation (Chapter 245, Acts of 1931)		\$919,774 00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books		17,497 08
		\$937,271 08

	Expenditures	
Administration and Engineering:		
Police		\$262,944 94
Salaries:		
Commissioners	\$2,500 00	
Secretary, clerks, etc.	14,645 62	
Chief engineer and assistants	30,057 05	
		47,202 67
Rent, care and lighting of building		3,549 51
Stationery, office supplies and expenses		5,273 53
Printing		200 63
Engineering supplies and expenses:		
General	\$4,383 69	
Auto expenses	1,195 22	
		5,578 91
Pensions and annuities		27,035 06
Retirement payments		6,399 44
Deficiency appropriation		174 00
		\$358,358 69
Blue Hills Division:		
Labor and teaming:		
General	\$78,360 84	
Moth work	32,149 38	
Road repairs	1,412 85	
		\$111,923 07
Street lighting		3,115 17
Supplies and miscellaneous expenses:		
General	\$31,536 47	
Moth work	2,071 76	
Road repairs	1,028 94	
		34,637 17
		149,675 41
Middlesex Fells Division:		
Labor and teaming:		
General	\$60,594 29	
Moth work	33,578 19	
Road repairs	1,486 16	
		\$95,658 64
Supplies and miscellaneous expenses:		
General	\$22,368 14	
Moth work	2,899 30	
		25,267 44
		120,926 08
Revere Beach Division:		
Labor and teaming:		
General	\$61,278 28	
Road repairs	648 77	
		\$61,927 05
Street lighting		12,754 56
Supplies and miscellaneous expenses:		
General	\$19,246 70	
Road repairs	1,658 54	
		20,905 24
		95,586 85

Charles River Upper Division:

Charles River Lower Basin:

Engineering Department:

METROPOLITAN PARKS MAINTENANCE FUND, SPECIALS

Expenditures

BORDER ROADS

DEVELOPMENT OF CERTAIN LAND IN DEDHAM

BATHING FACILITIES ON CHARLES RIVER

Appropriation (Chapter 426, Acts of 1930)																\$10,000	00
Expended to Nov. 30, 1930																7,407	41
<hr/>																	
																\$2,592	59
<i>Expenditures</i>																	
Construction:																	
Labor and materials																2,590	65
<hr/>																	
Balance, Dec. 1, 1931																\$1	94

Metropolitan Parks Maintenance Fund, Specials—Continued

BRUSH CUTTING, CLEARING, ETC.

Appropriation (Chapter 1, Acts of 1931)	\$100,000 00
" (Chapter 14, Acts of 1931)	50,000 00
" (Chapter 465, Acts of 1931)	80,000 00

\$230,000 00

Expenditures

Labor:	
Blue Hills Division	\$58,332 36
Middlesex Fells Division	43,423 90
Revere Beach Division	8,192 00
Charles River Upper Division	42,325 93
Charles River Lower Basin	7,536 00
General Expense	24 00
	<hr/>
	159,834 19
Balance, Dec. 1, 1931	<hr/>
	\$70,165 81

REPAIRING DAMAGES, SHORE WALLS, ETC.

Appropriation (Chapter 189, Acts of 1931)	\$185,000 00
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Expenditures

Construction:	
Contracts:	
M. McDonough Co.	\$26,882 86
M. McDonough Co.	9,016 09
Simpson Bros. Corporation	27,817 89
	<hr/>
	\$63,716 84
Labor and materials	17,876 68
	<hr/>
	\$81,593 52
Engineering:	
Services	\$5,137 92
Expenses	403 30
	<hr/>
	5,541 22
Architect services	35 88
Other services	839 65
Borings	215 20
Advertising	146 95
	<hr/>
	88,372 42
Balance, Dec. 1, 1931	<hr/>
	\$96,627 58

MOSQUITO CONTROL IN RESERVATIONS

Appropriation (Chapter 245, Acts of 1931)	\$10,000 00
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Expenditures

Labor and materials:	
Middlesex Fells Division	\$2,519 59
Charles River Upper Division	3,539 95
	<hr/>
	6,059 54
Balance, Dec. 1, 1931	<hr/>
	\$3,940 46

STREAM GAUGING

Appropriation (Chapter 245, Acts of 1931)	\$1,350 00
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Expenditures

Charles River Upper Division:	
Labor and materials	1,040 86
	<hr/>
Balance, Dec. 1, 1931	\$309 14

POLICE STATION, REVERE BEACH

Appropriation (Chapter 245, Acts of 1931)	\$40,000 00
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Expenditures

Construction:	
Contract, Allan A. Gillis Construction Co.	\$9,324 50
Engineering services	2 45
Architect services	697 63
Other services	100 00
Advertising	38 00
	<hr/>
	10,162 58
Balance, Dec. 1, 1931	<hr/>
	\$29,837 42

GOLF COURSE, BLUE HILLS RESERVATION

Appropriation (Chapter 460, Acts of 1931)	\$80,000 00
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Expenditures

Golf Course:	
Construction:	
Contract, C. and R. Construction Co.	\$30,260 00
Labor and materials	3,252 79
	<hr/>
	\$33,512 79

Engineering:					
Services	\$336 18
Expenses	18 45
					\$354 63
Architect services	3,900 00
Miscellaneous	7 50
					\$37,774 92
Locker and Professional Buildings:					
Engineering services	\$2 45
Other services	75 00
Advertising	37 05
					114 50
					<u>\$37,889 42</u>
Balance, Dec. 1, 1931	\$42,110 58

Appropriation (Chapter 460, Acts of 1931)	\$5,000 00
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Construction:	
Contract, Carl S. Helrich	\$2,924 00
Engineering services	7 20
Other services	50 00
Advertising	40 09
	<u>3,021 29</u>
 Balance, Dec. 1, 1931	 \$1,978 71

Appropriation (Chapter 245, Acts of 1931)	\$608,000 00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books	10,466 54

Administration and Engineering:			
Police		\$112,448 52	
Salaries:			
Commissioners	\$2,500 00		
Secretary, clerks, etc.	14,764 07		
Chief engineer and assistants	31,347 58		
		48,611 65	
Rent, care and lighting of building		3,553 33	
Stationery, office supplies and expenses		4,617 07	
Printing		200 64	
Engineering supplies and expenses:			
General	\$2,920 90		
Auto expenses	1,465 87		
		4,386 77	
Retirement payments		998 58	
			\$174,816 56
Blue Hills Division:			
Labor and teaming:			
General	\$42,147 17		
Moth work	1,804 05		
Road repairs	352 00		
		\$44,303 22	
Street lighting		19,621 41	
Supplies and miscellaneous expenses:			
General	\$7,378 92		
Road repairs	703 34		
		8,082 26	
			72,006 89
Middlesex Falls Division:			
Labor and teaming:			
General	\$76,136 26		
Moth work	2,060 65		
Road repairs	5,982 89		
		\$84,179 80	
Street lighting		34,537 95	
Supplies and miscellaneous expenses:			
General	\$24,451 48		
Moth work	463 49		
Road repairs	2,475 20		
		27,390 17	
			146,107 92
Revere Beach Division:			
Labor and teaming:			
General	\$51,184 64		
Moth work	106 53		
Road repairs	1,109 93		
Drainage, Revere Beach Parkway	6,124 63		
		\$58,525 73	
Street lighting		17,150 09	
Supplies and miscellaneous expenses:			
General	\$13,732 76		
Road repairs	1,317 50		
Drainage, Revere Beach Parkway	6,504 74		
		21,555 00	
			97,230 82

[illegible]

Appropriation (Chapter 343, Acts of 1927. Reappropriated by Chapter 386, Acts of 1929)	\$35,000 00
Expended to Nov. 30, 1930	19,840 29
	<hr/>
	\$15,159 71

										Expenditures			
Construction:													
Contract, C. M. Callahan, Inc.										\$11,926	62		
Labor and materials										553	64		
												\$12,480	26
Engineering:													
Services										\$50	90		
Expenses										9	40		
												60	30
Land												650	00
Legal:													
Services										\$11	04		
Expenses										2	42		
												13	46
													13,204 02
Balance, Dec. 1, 1931													\$1,955 69

Metropolitan Parks Maintenance Fund, Boulevards, Specials—Continued

CIRCUMFERENTIAL HIGHWAY

Appropriation (Chapter 398, Acts of 1926)	.	.	.	.	.	.	.	\$115,000	00
" (Chapter 386, Acts of 1929)	.	.	.	.	.	.	.	159,000	00
" (Chapter 115, Acts of 1930)	.	.	.	.	.	.	.	371,000	00
" (Chapter 460, Acts of 1931)	.	.	.	.	.	.	.	28,947	37
								\$673,947	37
Expended to Nov. 30, 1930	.	.	.	.	.	.	.	411,733	94
								\$262,213	43

Expenditures

Lynn Fells Parkway:

Construction:		
Labor and materials		\$744 48
Engineering:		
Services	\$39 50	
Expenses	25	
	<hr/>	39 75
Land		3,700 00
Legal:		
Services	\$42 20	
Expenses	5 22	
	<hr/>	47 42
Architect services		12 00
		<hr/>
Credit on account of filling sold		\$4,543 65
		22,506 25
		<hr/>
		— \$17,962 60

East Milton Street:

East Milton Street:							
Construction:							
Contract, Thomas J. McCue	.	.	.	.	.	\$4,377	26
Engineering:							
Services	.	.	.	.	.	\$105	85
Expenses	.	.	.	.	.	5	60
						<hr/>	
							111 45
Land	.	.	.	.	.		1,009 75
Legal:							
Services	.	.	.	.	.	\$84	86
Expenses	.	.	.	.	.	69	59
						<hr/>	
							154 45
Other services	.	.	.	.	.		251 00
Miscellaneous	.	.	.	.	.		5 00
						<hr/>	
							5.908 91

Fellsway East Extension:

Fairway East Extension:							
Construction:							
Contract, C. M. Callahan, Inc.						\$124,386	06
Labor and materials						1,235	71
						<hr/>	\$125,621 77
Engineering:							
Services						\$12,754	18
Expenses						1,067	03
						<hr/>	13,821 21
Land							7,747 00
Legal:							
Services						\$426	93
Expenses						44	45
						<hr/>	471 38
Appraising							600 00
Advertising							68 75
						<hr/>	148,330 11
Walnut Street Extension:							
Engineering services							223 00

Balance, Dec. 1, 1931

LAND FOR BOULEVARD ALONG CHARLES RIVER

Appropriation (Chapter 343, Acts of 1927)	.	.	.	.	.	.	.	\$80,000 00
" (Chapter 127, Acts of 1928)	.	.	.	.	.	.	.	100,000 00
" (Chapter 146, Acts of 1929)	.	.	.	.	.	.	.	200,000 00
								\$380,000 00
Expended to Nov. 30, 1930	.	.	.	.	.	.	.	328,817 56
								\$51,182 44

Expenditures

[illegible]

LAND AND FILLING, BROOKLINE-NEWTON BOULEVARD

Appropriation (Chapter 358, Acts of 1929)	.	.	.	.	.	.	.	.	\$50,000 00
" (Chapter 386, Acts of 1929)	.	.	.	.	.	.	.	.	25,000 00
									\$75,000 00
Expended to Nov. 30, 1930	.	.	.	.	.	.	.	.	49,842 62
									\$25,157 38

Metropolitan Parks Maintenance Fund, Boulevards, Specials—Continued
Land and Filling, Brookline-Newton Boulevard—Concluded

<i>Expenditures</i>			
Construction:			
Contract, C. & R. Construction Co.	.	.	\$2,007 75
Engineering:			
Services	.	.	\$1,435 98
Expenses	.	.	60 32
			<hr/> 1,496 30
Land	.	.	3,400 00
Legal:			
Services	.	.	\$33 55
Expenses	.	.	28 20
			<hr/> 61 75
			<hr/> \$6,965 80
Balance, Dec. 1, 1931	.	.	\$18,191 58

RECONSTRUCTION FELLSWAY, FOREST AND MAIN STREETS

Appropriation (Chapter 426, Acts of 1930)	.	.	\$260,000 00
Expended to Nov. 30, 1930	.	.	108,041 82
			<hr/> \$151,958 18

<i>Expenditures</i>			
Construction:			
Contract, C. & R. Construction Co.	.	.	\$137,853 57
Labor and materials	.	.	3,813 69
			<hr/> \$141,667 26
Engineering:			
Services	.	.	\$3,745 49
Expenses	.	.	435 87
			<hr/> 4,181 36
Architect services	.	.	18 00
			<hr/> 145,866 62
Balance, Dec. 1, 1931	.	.	\$6,091 56

TRAFFIC CIRCLE AT REVERE BEACH AND MIDDLESEX FELS PARKWAYS

Appropriation (Chapter 426, Acts of 1930)	.	.	\$40,000 00
Expended to Nov. 30, 1930	.	.	19,685 74
			<hr/> \$20,314 26

<i>Expenditures</i>			
Construction:			
Contract, M. McDonough Company	.	.	\$6,982 11
Labor and materials	.	.	480 31
			<hr/> \$7,462 42
Engineering:			
Services	.	.	\$376 00
Expenses	.	.	18 30
			<hr/> 394 30
			<hr/> 7,856 72
Balance, Dec. 1, 1931	.	.	\$12,457 54

LAND, MEMORIAL DRIVE AND BOYLSTON STREET

Appropriation (Chapter 426, Acts of 1930)	.	.	\$20,000 00
No expenditures	.	.	—
			<hr/> \$20,000 00
Balance, Dec. 1, 1931	.	.	\$20,000 00

LAND FOR EXTENSION, FURNACE BROOK PARKWAY

Appropriation (Chapter 426, Acts of 1930)	.	.	\$90,000 00
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<i>Expenditures</i>			
Engineering:			
Services	.	.	\$1,402 99
Expenses	.	.	83 89
			<hr/> 1,486 88

Balance transferred to Resurfacing Reedsdale and Brook Roads, Milton, in accordance with Chapter 460, Acts of 1931	.	.	\$88,513 12
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LAND, BOULEVARD, NEWBURYPORT TURNPIKE TO LYNN WOODS PARKWAY

Appropriation (Chapter 426, Acts of 1930)	.	.	\$10,000 00
No expenditures	.	.	—
			<hr/> \$10,000 00
Balance, Dec. 1, 1931	.	.	\$10,000 00

REPAIRING DAMAGES

Appropriation (Chapter 189, Acts of 1931)	.	.	\$15,000 00
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<i>Expenditures</i>			
Construction:			
Contract, M. McDonough Company	.	.	\$8,733 54
Labor and materials	.	.	5,370 43
			<hr/> \$14,103 97
Engineering:			
Services	.	.	\$745 81
Expenses	.	.	39 17
			<hr/> 784 98
Advertising	.	.	60 15
			<hr/> 14,949 10
Balance, Dec. 1, 1931	.	.	\$50 90

Metropolitan Parks Maintenance Fund, Boulevards, Specials—Continued

RESURFACING REEDSDALE AND BROOK ROADS, MILTON

Appropriation (Chapter 460, Acts of 1931)	\$88,513 12
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Expenditures

	<i>Expenditures</i>		
Construction:			
Contract, Coleman Bros., Inc.	\$53,358 55	
Labor and materials	. . . . .	684 88	
		<hr/>	\$54,043 43
Engineering:			
Services	. . . . .	\$2,571 33	
Expenses	. . . . .	139 00	
		<hr/>	2,710 33
Advertising	. . . . .	.	45 25
			<hr/>
			56,799 01
Balance, Dec. 1, 1931	. . . . .	.	<hr/>\$31,714 11

BROOKLINE-NEWTON BOULEVARD

Appropriation (Chapter 460, Acts of 1931)	\$231,578 95
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Expenditures

												<i>Expenditures</i>			
Engineering:															
Services	:	:	:	:	:	:	:	:	:	:	:		\$800	83	
Expenses	:	:	:	:	:	:	:	:	:	:	:		77	17	
												<hr/>		878 00	
Balance, Dec. 1, 1931	.	.	.	.	.	.	.	.	.	.	.	.	.	.	\$230,700 95

RECONSTRUCTION ALEWIFE BROOK PARKWAY

Appropriation (Chapter 460, Acts of 1931)	\$100,000 00
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Expenditures

	Expenditures		
Construction:			
Contract, Simpson Bros. Corporation	\$74,730 82		
Labor and materials	1,874 61		
	<hr/>	\$76,605 43	
Engineering:			
Services	\$5,392 55		
Expenses	316 99		
	<hr/>	5,709 54	
Legal:			
Services	\$34 57		
Expenses	3 70		
	<hr/>	38 27	
Appraising . . . . .	.	40 00	
Advertising . . . . .	.	61 00	
		<hr/>	82,454 24
Balance, Dec. 1, 1931 . . . . .	.	.	\$17,545 76

BOULEVARD, FELLSWAY TO MYSTIC AVENUE, MEDFORD

Appropriation (Chapter 460, Acts of 1931)	\$189,473 68
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Expenditures

						<i>Expenditures</i>						
Construction:												
Labor and materials	\$78 64
Engineering:												
Services	.	.	.	.	.	.	.	.	.	.	.	\$283 45
Expenses	.	.	.	.	.	.	.	.	.	.	.	95
											284 40	
											363 04	
Balance, Dec. 1, 1931												\$189,110 64

WORK OF PREVIOUS YEARS

		WORK OF PREVIOUS YEARS		
Appropriation (Chapter 460, Acts of 1931)	.	.	.	\$11,700 00

Expenditures

Resurfacing Boulevards and Parkways:

Construction:						
Contracts:						
M. McDonough Company	.	:	:	:	\$4,630 80	
University Excavating Company	.	:	:	:	2,000 00	
					<hr/>	
					\$6,630 80	
Labor and materials	.	.	.	.	2 00	
					<hr/>	\$6,632 80
Extension of Quincy Shore Reservation:						
Construction:						
Labor and materials	.	.	.	.	\$175 00	
Land	.	.	.	.	75 00	
Legal:						
Services	.	.	.	.	\$14 15	
Expenses	.	.	.	.	2 42	
					<hr/>	
					16 57	
					<hr/>	266 57
						<hr/>
						6,899 37
						<hr/>
Balance, Dec. 1, 1931	.	.	.	.	.	\$4,800 63

Appropriation (Chapter 245, Acts of 1931)	\$216,750 00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books	7,242 40
	<hr/>
	\$223,992 40

		Expenditures	
Park and Water Areas:			
Police			\$77,526 74
Labor and teaming:			
General		\$45,069 77	
Moth work		210 00	
Road repairs		30 25	
			45,310 02
Street lighting			4,784 33
Supplies and miscellaneous expenses:			
General			10,749 44
			<u>\$138,370 53</u>
Locks, Gates and Drawbridges:			
Labor:			
General		\$53,840 60	
Bridge repairs		8,084 06	
			\$61,924 66
Supplies and miscellaneous expenses:			
General		\$13,212 15	
Bridge repairs		385 61	
			<u>13,597 76</u>
			75,522 42
Retirement payments			925 86
			<u></u>
Balance, Dec. 1, 1931			

Appropriation (Chapter 245, Acts of 1931)	\$90,500 00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books	627 24
	<hr/>
	\$91,127 24

Police	\$30,521 84	
Labor and teaming:		
General	39,564 25	
Street lighting	1,767 62	
Supplies and miscellaneous expenses:		
General	\$17,925 23	
Road repairs	136 76	
	<u>18,061 99</u>	
		89,915 70
Balance, Dec. 1, 1931		<u>\$1,211 54</u>

Appropriation (Chapter 245, Acts of 1931)	\$22,000 00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books	113 52
	<hr/>
	\$22,113 52

[illegible]

Police	\$4,247	51
General labor	5,752	08
Flood lighting	271	60
Supplies and miscellaneous expenses	1,394	69
										11,665 88
Balance, Dec. 1, 1931	\$1,334	12

STEPS AND WALKS

Analysis of 1931 Receipts

BONDS, SINKING FUND AND NET DEBT

Serial Notes issued:

Parks Division

Bonds issued:

Metropolitan Parks Construction Fund, Series II

Bonds issued:

Sinking Fund Bonds:			
Year ending Nov. 30, 1931	.	.	-
Period prior to Dec. 1, 1930	.	.	\$2,567,500 00
			<u>2,567,500 00</u>
Serial Bonds and Notes:			
Year ending Nov. 30, 1931	.	.	-
Period prior to Dec. 1, 1930	.	.	\$2,383,056 62
			<u>2,383,056 62</u>
			<u>\$4,950,556 62</u>

Bonds, Sinking Fund and Net Debt—Concluded

Serial Bonds and Notes paid:					
Year ending Nov. 30, 1931	.	.	.	\$105,937 50	
Period prior to Dec. 1, 1930	.	.	.	1,001,994 12	
					\$1,107,931 62
Bonds outstanding Dec. 1, 1931				.	\$3,842,625 00
Sinking Fund:					
Total, Dec. 1, 1931	.	.	.	\$1,820,952 34	
Total, Dec. 1, 1930	.	.	.	1,743,530 53	
Increase during 1931	.	.	.	.	\$77,421 81
Net Debt:					
Total, Dec. 1, 1931	.	.	.	\$2,021,672 66	
Total, Dec. 1, 1930	.	.	.	2,205,031 97	
Decrease during 1931	.	.	.	.	\$183,359 31
Charles River Basin Construction:					
Bonds issued:					
Sinking Fund Bonds:					
Year ending Nov. 30, 1931	.	.	.	-	
Period prior to Dec. 1, 1930	.	.	.	\$4,125,000 00	
					\$4,125,000 00
Serial Bonds:					
Year ending Nov. 30, 1931	.	.	.	-	
Period prior to Dec. 1, 1930	.	.	.	\$375,000 00	
					375,000 00
					\$4,500,000 00
Serial Bonds paid:					
Year ending Nov. 30, 1931	.	.	.	\$10,000 00	
Period prior to Dec. 1, 1930	.	.	.	182,000 00	
					192,000 00
Bonds outstanding Dec. 1, 1931				.	\$4,308,000 00
Sinking Fund:					
Total, Dec. 1, 1931	.	.	.	\$2,249,296 64	
Total, Dec. 1, 1930	.	.	.	2,161,777 25	
Increase during 1931	.	.	.	.	\$87,519 39
Net Debt:					
Total, Dec. 1, 1931	.	.	.	\$2,058,703 36	
Total, Dec. 1, 1930	.	.	.	2,156,222 75	
Decrease during 1931	.	.	.	.	\$97,519 39
Charles River Bridges Construction:					
Notes issued:*					
Year ending Nov. 30, 1931	.	.	.	-	
Period prior to Dec. 1, 1930	.	.	.	\$4,400,000 00	
					\$4,400 00 00
Notes paid:					
Year ending Nov. 30, 1931	.	.	.	-	
Period prior to Dec. 1, 1930	.	.	.	\$4,400,000 00	
					\$4,400,000 00

* Including renewals.

SEWERAGE DIVISION
Construction

METROPOLITAN SEWERAGE CONSTRUCTION FUND, NORTH SYSTEM

Total amount authorized to Dec. 1, 1930	.	.	.	.	.	\$8,611,521 55
Receipts:						
For the year ending Nov. 30, 1931	.	.	.	.	.	-
For the period prior to Dec. 1, 1930	.	.	.	.	.	\$87,514 78
						87,514 78
						\$8,699,036 33

Expenditures

Sewer in Arlington and Medford:					
Section 78:					
Engineering expenses	.	.	.	\$0 78	
Legal services	.	.	.	38 56	
Appraising	.	.	.	75 00	
					\$114 34
Section 81:					
Construction:					
Labor and materials	.	.	.	1,000 00	
					\$1,114 34
New Mystic Valley Main Sewer:					
Section 109:					
Construction:					
Labor and materials	.	.	.	\$40 90	
Engineering expenses	.	.	.	30	
Legal:					
Services	.	.	.	\$26 98	
Expenses	.	.	.	2 20	
					29 18
Easements	.	.	.	2,400 00	
					\$2,470 38

Metropolitan Sewerage Construction Fund, North System—Concluded

Section 78:

Engineering expenses	\$0.20		
Legal:			
Services	\$30 68		
Expenses	1 20		
		31 88	
Other services		500 00	
Easements		1,465 82	
			\$1,997 90

Section 82:

Construction:			
Labor and materials	\$699 98		
Engineering:			
Services	\$2,193 87		
Expenses	659 36		
		2,853 23	
Advertising		22 80	
			3,576 01
			\$8,044 29

		\$9,158 63	
Amounts charged to Nov. 30, 1930		8,621,340 83	
			\$8,630,499 46
Balance, Dec. 1, 1931			\$68,536 87

METROPOLITAN SEWERAGE CONSTRUCTION FUND, SOUTH SYSTEM

Total amount authorized to Dec. 1, 1930	\$13,120,151 75
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Receipts:

For the year ending Nov. 30, 1931	—	
For the period prior to Dec. 1, 1930	\$24,599 61	
		24,599 61
		\$13,144,751 36

Expenditures

New Neponset Valley Sewer:

Section 107:

Construction:			
Contract, V. Barletta Co.	\$16,905 90		
Labor and materials	100 00		
		\$17,005 90	
Engineering expenses		1 06	
			\$17,006 96

Section 108:

Construction:			
Contract, Frank W. Christy	\$20,166 21		
Legal:			
Services	\$45 60		
Expenses	6 54		
		52 14	
Appraising		75 00	
Easements		1,800 00	
			22,093 35

Section 109:

Construction:			
Contract, V. Barletta Co.	\$17,115 48		
Engineering expenses	60		
Legal expenses	9 41		
Easements	625 00		
			17,750 49

Part of Section 109:

Construction:			
Contract, V. Barletta Co.	\$147,999 39		
Labor and materials	669 14		
		\$148,668 53	
Engineering:			
Services	\$5,436 66		
Expenses	509 75		
		5,946 41	
Legal:			
Services	\$44 20		
Expenses	3 12		
		47 32	
Easements		1,500 00	
			156,162 26

Section 110:

Engineering expenses	\$29 71
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Part of Section 110:

Construction:			
Contract, J. H. Ferguson and Co.	\$206,906 60		
Labor and materials	669 89		
		\$207,576 49	
Engineering:			
Services	\$6,809 58		
Expenses	771 61		
		7,581 19	

Metropolitan Sewerage Construction Fund, South System—Continued

Legal:					
Services	\$79	59			
Expenses	7	84			
				\$87	43
Easements				3,000	00
					\$218,245 11
Section 111:					
Construction:					
Contract, Frank W. Christy	\$95,426	70			
Labor and materials .	916	03			
				\$96,342	73
Engineering:					
Services	\$3,455	00			
Expenses	303	16			
				3,758	16
					100,100 89
Section 112:					
Construction:					
Contract, C. and R. Con-					
struction Company .	\$87,322	18			
Labor and materials .	988	44			
				\$88,310	62
Engineering:					
Services	\$2,437	40			
Expenses	382	78			
				2,820	18
					91,130 80
Section 113:					
Construction:					
Contract, A. Baruffaldi .	\$96,327	28			
Labor and materials .	783	18			
				\$97,110	46
Engineering:					
Services	\$4,699	52			
Expenses	503	39			
				5,202	91
Legal:					
Services	\$66	22			
Expenses	10	92			
				77	14
Easements				225	00
					102,615 51
Section 114:					
Construction:					
Contract, V. Barletta Co.	\$82,913	25			
Labor and materials .	1,529	64			
				\$84,442	89
Engineering:					
Services	\$5,596	39			
Expenses	872	77			
				6,469	16
Legal:					
Services	\$164	00			
Expenses	1	60			
				165	60
Easements				50	00
Appraising				100	00
					91,227 65
Section 115:					
Construction:					
Contract, A. D. Daddario.	\$102,264	15			
Labor and materials .	2,060	50			
				\$104,324	65
Engineering:					
Services	\$4,567	16			
Expenses	626	48			
				5,193	64
Legal:					
Services	\$164	91			
Expenses	1	60			
				166	51
Appraising				75	00
					109,759 80
Section 116:					
Construction:					
Contract, A. D. Daddario.	\$77,464	15			
Labor and materials .	2,497	34			
				\$79,961	49
Engineering:					
Services	\$4,034	60			
Expenses	1,429	69			
				5,464	29
Legal:					
Services	\$408	41			
Expenses	22	22			
				430	63
Easements				50	00
Appraising				150	00
					86,056 41

Metropolitan Sewerage Construction Fund, South System—Continued

Section 117:

Construction:

Contract, J. F. Fitzgerald

Construction Co. . . . \$68,153 42

Labor and materials . . . 2,525 73

\$70,679 15

Engineering:

Services \$7,263 42

Expenses 1,614 61

8,878 03

Legal:

Services \$208 37

Expenses 25 90

234 27

Appraising

125 00

\$79,916 45

Section 118:

Construction:

Contract, C. and R. Con-
struction Co. . . . \$13,304 62

Labor and materials . . . 490 37

\$13,794 99

Engineering:

Services \$6,466 84

Expenses 1,175 44

7,642 28

Legal:

Services \$181 58

Expenses 17 02

198 60

21,635 87

Section 119:

Construction:

Contract, Frank W. Christy . . . \$28,317 41

Labor and materials . . . 1,907 05

\$29,324 46

Engineering:

Services \$4,668 17

Expenses 797 68

5,465 85

Legal:

Services \$111 34

Expenses 14 72

126 06

Appraising

100 00

35,016 37

Section 120:

Engineering:

Services \$2,846 05

Expenses 498 58

\$3,344 63

Advertising

46 45

3,391 08

Section 121:

Engineering:

Services \$545 00

Expenses 58 63

603 63

Miscellaneous

10 42

\$1,152,752 76

Sewers in Braintree, Weymouth and Quincy:

Section 122:

Engineering:

Services \$695 00

Expenses 404 83

\$1,099 83

Section 123:

Engineering:

Services \$835 00

Expenses 290 23

1,125 23

Section 124:

Construction:

Labor and materials \$700 00

Engineering:

Services \$1,427 26

Expenses 302 19

1,729 45

2,429 45

Section 125:

Construction:

Contract, Edward P. Healey . . . \$100 00

Labor and materials . . . 600 55

\$700 55

Metropolitan Sewerage Construction Fund, South System—Concluded
Sewers in Braintree, Weymouth and Quincy—Concluded
Section 125—Concluded

Engineering:							
Services	.	.	.	\$3,901	67		
Expenses	.	.	.	578	32		
				<hr/>		\$4,479	99
Legal:							
Services	.	.	.	\$8	56		
Expenses	.	.	.	11	04		
				<hr/>		19	60
Advertising	.	.	.	.	.	44	50
				<hr/>		\$5,244	64
Braintree-Weymouth Pumping Station:							
Engineering expenses	.	.	.	.	.	35	49
				<hr/>		\$9,934	64
Gravity Drainage, City of Quincy:							
Construction:							
Contract, A. D. Daddario	.	.	.	\$8,682	75		
Labor and materials	.	.	.	2,698	58		
				<hr/>		\$11,381	33
Engineering:							
Services	.	.	.	.	\$730	00	
Expenses	.	.	.	.	924	97	
				<hr/>		1,654	97
Legal:							
Services	.	.	.	.	\$163	93	
Expenses	.	.	.	.	25	30	
				<hr/>		189	23
Land damages	.	.	.	.	.	1,800	00
Advertising	.	.	.	.	.	58	15
				<hr/>		15,083	68
				<hr/>		\$1,177,771	08
Amounts charged to Nov. 30, 1930	.	.	.	.	.	10,590,231	92
				<hr/>		\$11,768,003	00
				<hr/>		\$1,376,748	36
Balance, Dec. 1, 1931	.	.	.	.	.	.	.

Miscellaneous

DRAINAGE IN EVERETT, MALDEN AND REVERE

Authorization (Chapter 456, Acts of 1924)			\$70,000 00
	<i>Expenditures</i>		
Construction:			
Contract, M. McDonough Company	\$6,665 33		
Labor and materials	141 70		
	<hr/>	\$6,807 03	
Engineering:			
Services	\$53 40		
Expenses	8 49		
	<hr/>	61 89	
Legal:			
Services	\$162 56		
Expenses	31 28		
	<hr/>	193 84	
Legal notices		351 75	
Services of apportioning commission.		3,619 21	
Easements		2,600 00	
		<hr/>	\$13,633 72
Amounts charged to Nov. 30, 1930		29,409 65	
		<hr/>	43,043 37
Balance, Dec. 1, 1931			<hr/> \$26,956 63

Maintenance

METROPOLITAN SEWERAGE MAINTENANCE FUND, NORTH SYSTEM—GENERAL

Appropriation (Chapter 245, Acts of 1931)	.	.	.	.	.	.	.	\$375,300	00
“ (Chapter 14, Acts of 1931)	.	.	.	.	.	.	.	2,000	00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books								16,222	71
								<u>\$393,522</u>	<u>71</u>

Expenditures

Administration and Engineering:

Salaries:			
Commissioners	.	.	\$1,250 00
Secretary and clerks	.	.	7,024 36
Chief engineer and assistants	.	.	18,200 97
			<hr/>
			\$26,475 33
Rent, care and lighting of building	.	.	1,458 49
Printing	.	.	103 00
Stationery, office supplies and expenses	.	.	1,795 37
Engineering supplies and expenses	.	.	308 65
			<hr/>
			\$30,140 84
Industrial accident compensation	.	.	635 29
Retirement payments	.	.	4,092 09
			<hr/>
			\$34,868 22

Metropolitan Sewerage Maintenance Fund, North System—General—Concluded

Deer Island Pumping Station:			
Labor		\$43,385 89	
Fuel		13,152 57	
Oil, waste and packing		817 53	
Water		1,734 54	
Repairs and renewals		1,085 21	
General supplies		1,090 27	
Miscellaneous expenses		211 45	
			\$61,477 46
East Boston Pumping Station:			
Labor		\$41,543 35	
Fuel		19,234 42	
Oil, waste and packing		1,395 17	
Water		2,186 42	
Repairs and renewals		3,176 18	
General supplies		1,232 90	
Miscellaneous expenses		338 41	
			69,106 85
Charlestown Pumping Station:			
Labor		\$32,025 15	
Fuel		7,891 21	
Oil, waste and packing		712 07	
Water		560 60	
Repairs and renewals		418 42	
General supplies		408 76	
Miscellaneous expenses		54 78	
			42,070 99
Alewife Brook Pumping Station:			
Labor		\$17,098 25	
Fuel		2,799 67	
Oil, waste and packing		317 58	
Water		594 30	
Repairs and renewals		44 49	
General supplies		312 76	
Miscellaneous expenses		38 27	
			21,205 32
Reading Pumping Station:			
Labor		\$7,253 75	
Fuel		138 18	
Repairs and renewals		63 49	
General supplies		2,740 55	
Miscellaneous expenses		144 07	
			10,340 04
Sewer Lines, Buildings and Grounds:			
Engineering assistants		\$5,820 00	
Labor		80,139 24	
Deer Island Ferry		1,000 00	
Automobiles		1,012 66	
Brick, cement and lime		515 85	
Castings, ironwork and metal		558 01	
Lumber, paint and oils		1,937 90	
Machinery, tools and appliances		111 98	
Rubber and oiled goods		196 32	
Sand, gravel and stone		71 94	
Repairs		1,663 59	
General supplies		2,357 41	
Miscellaneous expenses		3,861 66	
Relocation of Aberjona Sewer		4,500 29	
			103,746 85
Stables:			
Labor		\$2,625 00	
Subsistence		298 61	
Miscellaneous expenses		256 06	
			3,179 67
Emergency labor (Chapter 14, Acts of 1931)			2,000 00
			\$347,995 40
Balance, Dec. 1, 1931			\$45,527 31

METROPOLITAN SEWERAGE MAINTENANCE FUND, SOUTH SYSTEM—GENERAL

Appropriation (Chapter 245, Acts of 1931)	\$236,100 00
“(Chapter 14, Acts of 1931)	1,000 00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books	10,753 10
	\$247,853 10

Expenditures

Administration and Engineering:			
Salaries:			
Commissioners	\$1,250 01		
Secretary and clerks	7,024 40		
Chief engineer and assistants	3,210 00		
		\$11,484 41	
Rent, care and lighting of building		1,458 41	
Printing		555 68	
Stationery, office supplies and expenses		1,760 16	
Engineering supplies and expenses		251 36	
			\$15,510 02
Industrial accident compensation		395 43	
Retirement payments		3,264 20	
			\$19,169 65

Metropolitan Sewerage Maintenance Fund, South System—General—Concluded

Ward Street Pumping Station:			
Labor		\$52,795 19	
Fuel		15,408 95	
Oil, waste and packing		1,174 90	
Water		2,101 00	
Repairs and renewals		17,385 22	
General supplies		1,601 36	
Miscellaneous expenses		1,276 00	
			\$91, 742 62
Quincy Pumping Station:			
Labor		\$16,490 30	
Fuel		4,379 44	
Oil, waste and packing		495 70	
Water		399 28	
Repairs and renewals		209 94	
General supplies		327 84	
Miscellaneous expenses		80 36	
			22,382 86
Nut Island Screen House:			
Labor		\$16,614 85	
Fuel		3,079 88	
Oil, waste and packing		205 40	
Water		579 17	
Repairs and renewals		2,272 96	
General supplies		564 78	
Miscellaneous expenses		112 54	
			23,429 58
Sewer Lines, Buildings and Grounds:			
Engineering assistants		\$5,610 00	
Labor		48,302 22	
Automobiles		1,127 75	
Brick, cement and lime		234 95	
Castings, ironwork and metal		23 56	
Lumber, paint and oils		1,252 02	
Machinery, tools and appliances		83 43	
Rubber and oiled goods		139 09	
Sand, gravel and stone		399 85	
Repairs		32 01	
General supplies		1,179 78	
Miscellaneous expenses		2,674 23	
Pumping by City of Boston		11,998 37	
			73,057 26
Stables:			
Labor		\$787 50	
Subsistence		97 35	
Miscellaneous expenses		149 70	
			1,034 55
Emergency labor (Chapter 14, Acts of 1931)			1,000 00
			\$231,816 52
Balance, Dec. 1, 1931			\$16,036 58

Analysis of 1931 Receipts

Credited to:			
Metropolitan Sewerage Sinking Fund, North System		\$175 00	
Metropolitan Sewerage Maintenance Fund, North System		5,713 07	
Metropolitan Sewerage Maintenance Fund, South System		5,790 96	
Metropolitan Sewerage Interest Fund, South System		151 74	
			\$11,830 77

BONDS, SINKING FUNDS AND NET DEBT

Metropolitan Sewerage Construction, North System:			
Bonds issued:			
Sinking Fund Bonds:			
Year ending Nov. 30, 1931		-	
Period prior to Dec. 1, 1930		\$6,563,000 00	
			\$6,563,000 00
Serial Bonds:			
Year ending Nov. 30, 1931		-	
Period prior to Dec. 1, 1930		\$1,725,500 00	
			1,725,500 00
			\$8,288,500 00
Sinking Fund Bonds paid:			
Year ending Nov. 30, 1931		-	
Period prior to Dec. 1, 1930		\$5,795,000 00	
			\$5,795,000 00
Serial Bonds paid:			
Year ending Nov. 30, 1931		\$94,500 00	
Period prior to Dec. 1, 1930		832,500 00	
			927,000 00
			6,722,000 00
Bonds outstanding Dec. 1, 1931			\$1,566,500 00

Metropolitan Water Construction Fund—Continued

Certain Improvements:			
Meters and Connections:			
Contract, Builders Iron Foundry	\$6,675 00		
Labor	2,403 39		
	<u>\$9,078 39</u>		
Supplies and expenses	1,303 02		
	<u></u>	\$10,381 41	
Low Service Lines, Section 9:			
Stock		1,282 06	
Southern High Service Lines, Section 52:			
Easements	\$17,250 00		
Legal services	24 43		
	<u></u>	17,274 43	
Less stock transferred to other accounts		49,806 53	
		<u></u>	—\$20,868 63
Property for Protection of Water Supply:			
Land		\$2,500 00	
Legal:			
Services	\$65 51		
Expenses	16 22		
	<u></u>	81 73	
		<u></u>	2,581 73
Additional Weston Aqueduct Supply Main:			
Section 13:			
Construction:			
Labor and materials.	\$525 33		
Engineering:			
Services	\$6,876 21		
Expenses	412 99		
	<u></u>	7,289 20	
Legal services	42 64		
	<u></u>	\$7,857 17	
Section 14:			
Construction:			
Contracts:			
C. and R. Construction Company			
Thomas J. McCue	\$185,147 59		
	14,561 20		
	<u>\$199,708 79</u>		
Labor and materials.	7,600 82		
	<u></u>	\$207,309 61	
Engineering:			
Services	\$16,832 96		
Expenses	1,405 48		
	<u></u>	18,238 44	
Legal:			
Services	\$40 30		
Expenses	9 00		
	<u></u>	49 30	
		<u></u>	225,597 35
Section 15:			
Construction:			
Contract, C. and R. Construction Company			
Labor and materials.	\$28,259 77		
	923 48		
	<u></u>	\$29,183 25	
Engineering:			
Services	\$2,231 68		
Expenses	47 65		
	<u></u>	2,279 33	
		<u></u>	31,462 58
Northern High Service Pipe Lines, Section 54:			
Construction:			
Contract, John Williams			
Labor and materials.	\$9,718 46		
	1,625 32		
	<u></u>	\$11,343 78	
Engineering:			
Services	\$2,059 88		
Expenses	26 00		
	<u></u>	2,085 88	
Legal:			
Services	\$67 01		
Expenses	11 89		
	<u></u>	78 90	
Appraising		10 00	
Easements		1,075 00	
		<u></u>	14,593 56

Metropolitan Water Construction Fund—Concluded

Northern High Service Pipe Lines, Section 55:

Construction:			
Contract, Cenedella and Com-			
pany	\$31,329 79		
Labor and materials	7,932 70		
		\$39,262 49	
Engineering:			
Services	\$6,222 00		
Expenses	151 13		
		6,373 13	
Legal:			
Services	\$95 12		
Expenses	8 37		
		103 49	
Appraising		20 00	
Easements		600 00	
		\$46,359 11	
Stock:			
Contracts:			
Warren Foundry and Pipe Co.	\$30,583 39		
Chapman Valve Manufacturing Co.	4,571 35		
Other stock	1,113 99		
		36,268 73	
		\$362,138 50	
Less stock transferred to other accounts		51,370 10	
		\$310,768 40	
		\$298,600 61	
Amounts charged to Nov. 30, 1930		47,802,499 64	
		\$48,101,100 25	
Balance Dec. 1, 1931		\$123,114 75	

METROPOLITAN WATER MAINTENANCE FUND—GENERAL

Appropriation (Chapter 245, Acts of 1931)	\$941,600 00
Balance brought forward from 1930 appropriation to cover 1930 expenditures on 1931 books	28,924 40
	\$970,524 40

Expenditures

Administration and Engineering:			
Salaries:			
Commissioners	\$2,500 01		
Secretary and clerks	14,048 66		
Chief engineer and assistants	28,304 02		
		\$44,852 69	
Rent, care and lighting of building		2,917 07	
Printing		206 01	
Stationery, office supplies and expenses		3,850 93	
Engineering supplies and expenses		6,025 84	
		\$57,852 54	
Payments in lieu of taxes		59,484 55	
Industrial accident compensation		4,268 99	
Retirement payments		10,295 53	
		\$131,901 61	
Wachusett Department:			
Superintendence		\$16,017 97	
Labor		103,019 53	
Supplies and expenses		17,614 92	
		136,652 42	
Sudbury Department:			
Superintendence		\$17,445 04	
Labor		135,574 01	
Supplies and expenses		24,778 31	
		177,797 36	
Distribution Department:			
Superintendence		\$16,993 22	
Labor		154,240 50	
Supplies and expenses		68,526 30	
		\$239,760 02	
Credit on account of stock transfer		807 79	
		238,952 23	
Pumping Service:			
Superintendence		\$11,926 33	
Arlington Pumping Station:			
Labor		\$20,892 68	
Fuel		3,549 70	
Oil, waste and packing		319 21	
Repairs		1,097 20	
Supplies		642 34	
		26,501 13	
Chestnut Hill Pumping Station, No. 1:			
Labor		\$32,171 85	
Fuel		11,566 93	
Oil, waste and packing		901 34	
Repairs		4,913 18	
Supplies		2,333 43	
		51,886 73	

[illegible]

Appropriation (Chapter 115, Acts of 1930, Item 771)	\$10,000 00
Expended to Nov. 30, 1930	8,814 86
							<hr/>
							\$1,185 14

		<i>Expenditures</i>					
Construction:							
Contract, Keasbey and Mattison Company		\$490 00
Engineering services	695 14
							<hr/>
							\$1,185 14

	CLEARING LAND									
Appropriation (Chapter 1, Acts of 1931)	.	:	:	:	:	:	:	:	:	\$10,000 00
" (Chapter 14, Acts of 1931)	.	:	:	:	:	:	:	:	:	5,000 00
										\$15,000 00

	<i>Expenditures</i>	
Emergency labor	\$14,923 71
Balance, Dec. 1, 1931	<hr/> \$76 29

Appropriation (Chapter 245, Acts of 1931, Item 694)	\$30,000 00
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	<i>Expenditures</i>	
Construction:		
Contracts:		
International Engineering Works . .	\$18,144 25	
F. Pritchard and Son, Inc. .	2,408 18	
	\$20,552 43	
Labor and materials .	3,939 43	
		\$24, 491 86
Engineering:		
Services . .	\$3,907 35	
Expenses . .	64 79	
		3,972 14
		28,464 00
Balance, Dec. 1, 1931 . .	.	\$1,536 00

Appropriation (Chapter 245, Acts of 1931, Item 695)	\$50,000 00
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[illegible]

Metropolitan Water Maintenance Fund—Specials—Concluded

IMPROVEMENTS, SUPPLY MAINS, ETC.

Appropriation (Chapter 245, Acts of 1931, Item 693)					\$400,000 00
Expenditures					
Section 13:					
Construction:					
Contract, C. and R. Construction Co.					\$79,526 97
Labor and materials					17,217 00
					<u>\$96,743 97</u>
Engineering:					
Services					\$7,630 11
Expenses					193 55
					<u>7,823 66</u>
Legal services					5 00
					<u>\$104,572 63</u>
Section 14:					
Construction:					
Contract, Thomas J. McCue					\$108,404 37
Labor and materials					12,168 85
					<u>\$120,573 22</u>
Engineering:					
Services					\$7,941 90
Expenses					227 45
					<u>8,169 35</u>
Legal:					
Services					\$44 79
Expenses					51 60
					<u>96 39</u>
					<u>128,838 96</u>
Stock:					
Contracts:					
Crane Company					\$27,727 93
New England Structural Co.					283 22
					<u>\$28,011 15</u>
Stock transferred from other accounts					93,585 86
					<u>\$121,597 01</u>
Less stock transferred to other accounts					9,057 80
					<u>112,539 21</u>
					<u>345,950 80</u>
Balance, Dec. 1, 1931					\$54,049 20

Analysis of 1931 Receipts

Credited to:									
Metropolitan Water Loan Interest Fund							\$167	75	
Metropolitan Water Construction Fund							1,400	08	
Metropolitan Water Sinking Fund							98,341	15	
Metropolitan Water Maintenance Fund							19,178	98	
							\$119,087	96	

BONDS, SINKING FUNDS AND NET DEBT

Metropolitan Water Construction:										
Bonds issued:										
Sinking Fund:										
Year ending Nov. 30, 1931	.	.	.	.	.	.	.	.	.	-
Period prior to Dec. 1, 1930	.	.	.	.	.	.	.	.	.	\$41,398,000 00
										<u>\$41,398,000 00</u>
Serial Bonds:										
Year ending Nov. 30, 1931	.	.	.	.	.	.	.	.	.	-
Period prior to Dec. 1, 1930	.	.	.	.	.	.	.	.	.	\$4,287,000 00
										<u>4,287,000 00</u>
										<u>\$45,685,000 00</u>
Serial Bonds paid:										
Year ending Nov. 30, 1931	.	.	.	.	.	.	.	.	.	\$118,000 00
Period prior to Dec. 1, 1930	.	.	.	.	.	.	.	.	.	1,082,000 00
										<u>1,200,000 00</u>
Bonds outstanding Dec. 1, 1931	.	.	.	.	.	.	.	.	.	\$44,485,000 00
Sinking Fund:										
Total, Dec. 1, 1931	.	.	.	.	.	.	.	.	.	\$29,935,468 43
Total, Dec. 1, 1930	.	.	.	.	.	.	.	.	.	28,673,516 38
										<u>\$1,261,952 05</u>
Increase during 1931	.	.	.	.	.	.	.	.	.	\$1,261,952 05
Net Debt:										
Total, Dec. 1, 1931	.	.	.	.	.	.	.	.	.	\$14,549,531 57
Total, Dec. 1, 1930	.	.	.	.	.	.	.	.	.	15,929,483 62
										<u>\$1,379,952 05</u>
Decrease during 1931	.	.	.	.	.	.	.	.	.	\$1,379,952 05

APPENDIX No. 1

CONTRACTS MADE AND PENDING DURING

Contract Number	WORK	Number of Bids	Lowest
150 ¹	Construction of an overflow in the Charles River Basin from the Boston Marginal Conduit near Fruit Street in the city of Boston.	5	\$30,291 75
151 ¹	Construction of Fellsway East Extension from East Border Road to Lynn Fells Parkway.	17	152,344 00
152 ¹	Resurfacing roadway on Charles River Dam, Boston and Cambridge.	16	54,619 30
153 ²	Resurfacing South Border Road, Winchester, northerly from near the Medford-Winchester line to Mystic Valley Parkway.	13	18,590 00
154 ¹	Alterations to steel superstructures of Western Division and Saugus Branch Bridges over the Boston and Maine Railroad tracks on the Revere Beach Parkway, Medford and Everett.	2	7,912 00
155 ¹	Rebuilding sea wall and repairs to shore protection and roadway, Ocean Avenue to Underhill Street, Winthrop Shore Reservation, Winthrop.	9	20,730 00
156 ¹	Alterations in abutments and piers and renewal of floors and pavement of Western Division and Saugus Branch Bridges, Revere Beach Parkway.	13	21,085 02
157 ¹	Resurfacing portions of Old Colony Parkway between Columbia Road and Quincy Shore Boulevard.	13	15,090 00
158 ²	Building sea wall and repairs to shore protection and roadway, Winthrop Parkway, Revere and Winthrop.	22	6,634 00
159 ²	Constructing surface water drain across Revere Beach Parkway, Revere, near Washburn Avenue Extension.	23	8,540 00
160 ¹	Reconstruction of Alewife Brook Parkway, Massachusetts Avenue, Cambridge, to Mystic Valley Parkway, Somerville.	13	85,991 55
161	Underpass, Memorial Drive at Massachusetts Avenue, Cambridge.	14	176,071 71
162 ¹	Widening and resurfacing portions of Revere Beach Parkway, Medford and Everett.	3	4,115 30
163 ¹	Reconstruction of Chickatawbut Road from west of Randolph Avenue to near Sassamon Notch Road, Milton.	8	22,036 50
164 ²	Golf course, Redman Farm, Canton.	13	44,500 00
165 ¹	Construction of Nonantum Road Extension from Hyde Brook, Newton, to Water Street, Watertown.	12	22,772 00
166	Additions to police station, Revere Beach.	9	27,500 00
167 ¹	Resurfacing Memorial Drive from Massachusetts Avenue to Longfellow Bridge.	15	51,446 00
168 ²	Repairs to shore protection at Woodbury's Point near Atlantic Terrace, Lynn, Lynn Shore Reservation.	14	39,520 00
169 ¹	Resurfacing Brook Road and Reedsdale Road, Blue Hills Parkway to Pleasant Street, Milton.	14	59,932 00
169A ¹	Repairing concrete girders on the four northerly spans of Wellington Bridge, Somerville and Medford.	4	3,625 00
170 ¹	Repairs to shore protection, Winthrop Highlands, Winthrop.	12	9,285 00
171 ¹	Resurfacing Adams Street to Quarry Street and Miller Street to Willard Street, Quincy, Furnace Brook Parkway.	10	20,198 50
172	Construction of skating shelter "St. Moritz" Blue Hills Reservation, Quincy.	23	3,650 00
173	Widening and extension of Boston Embankment.	8	273,683 35
174	Locker building and professional building at Ponkapoag Golf Course, Canton.	23	17,409 00
175	Traffic control signals at the Larz Anderson, Western Avenue and River Street Bridges, Boston and Cambridge.	2	11,350 00
176	Shore protection, Revere Beach Reservation.	17	41,548 00
177	Grading and steps, northeasterly side of Bunker Hill Monument.	16	10,830 00
178	Relocation of Bold Knob Road, Stony Brook Reservation, Boston.	13	11,749 00
179	Reinforced concrete floor for Revere Beach Parkway bridge over Boston, Revere Beach and Lynn Railroad, Revere.	8	4,750 00
180	Steel superstructure, Revere Beach Parkway bridge over Boston, Revere Beach and Lynn Railroad, Revere.	1	4,876 00

¹ Contract completed.² Second lowest bidder.

APPENDIX No. 1

THE YEAR 1931—PARKS DIVISION

Contractor	Date of Contract	Date of Completion	Value of Work done Dec. 31, 1931
Bay State Dredging and Contracting Co.	July 16, 1931	Nov. 21, 1931	\$32,941 23
C. M. Callahan, Inc.	Feb. 5, 1931	Nov. 18, 1931	154,705 41
Coleman Bros., Inc.	Mar. 19, 1931	July 29, 1931	58,279 39
M. McDonough Co.	Mar. 19, 1931	May 23, 1931	18,838 74
Boston Bridge Works	Apr. 9, 1931	July 20, 1931	7,912 00
M. McDonough Co.	Apr. 2, 1931	July 30, 1931	27,114 06
J. J. Collins	Apr. 23, 1931	Aug. 18, 1931	22,038 49
M. McDonough Co.	Apr. 23, 1931	July 15, 1931	13,238 36
M. McDonough Co.	May 21, 1931	Aug. 6, 1931	8,797 26
(Philip) Cenedella Co.	May 28, 1931	Sept. 9, 1931	12,249 26
Simpson Brothers Corp.	July 9, 1931	Nov. 18, 1931	87,918 61
Coleman Brothers, Inc.	July 9, 1931	—	182,312 81
M. McDonough Co.	July 2, 1931	Aug. 22, 1931	3,015 60
University Contracting Co.. . . .	July 23, 1931	Nov. 5, 1931	24,314 75
C. & R. Construction Co.	Aug. 6, 1931	—	35,600 00
Thomas Joseph McCue	Sept. 3, 1931	—	23,626 74
Gillis Construction Company	Sept. 24, 1931	—	10,970 00
John McCourt Co.	Aug. 20, 1931	Nov. 28, 1931	67,427 56
Simpson Brothers Corp.	Sept. 3, 1931	Dec. 9, 1931	33,178 48
Coleman Brothers, Inc.	Sept. 24, 1931	Nov. 30, 1931	67,804 00
National Gunite Contracting Co.	Sept. 3, 1931	Sept. 19, 1931	3,307 95
M. McDonough Co.	Sept. 17, 1931	Nov. 5, 1931	10,607 16
A. DeStefano & Son, Inc.	Oct. 8, 1931	Dec. 12, 1931	19,896 49
Carl S. Helrich	Oct. 15, 1931	—	3,440 00
Trimount Dredging Company	Oct. 29, 1931	—	22,148 52
Corsetti & Arcese Company	Nov. 25, 1931	—	4,479 65
Automatic Signal Corp.	Nov. 5, 1931	—	7,500 00
M. McDonough Co.	Nov. 19, 1931	—	12,589 70
M. McDonough Co.	Dec. 3, 1931	—	2,250 00
J. Susi and Brother	Nov. 25, 1931	—	6,477 45
M. McDonough Co.	Dec. 3, 1931	—	
Boston Bridge Works	Dec. 3, 1931	—	

APPENDIX No. 2

CONTRACTS MADE AND PENDING DURING
(The details of Contracts made before

1 Num- ber of Con- tract	2 WORK	3 Num- ber of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
76 ¹	Laying cast-iron water pipes, furnished by the Commonwealth, in Revere.	14	\$35,864 50	\$32,742 00 ²	Cenedella & Co., Milford, Mass.
78 ¹	Furnishing 6 20-inch gate valves.	3	5,250 00	4,170 00 ²	The Chapman Valve Manufacturing Co., Indian Orchard, Mass.
79 ¹	Furnishing and laying 60-inch electric-welded steel water pipes in Boston and Newton.	13	150,962 50 ²	145,647 00	C. and R. Construction Co., Boston.
80	Furnishing water valves, 24 12-inch, 16 16-inch, 24 20-inch, 6 36-inch screw-lift valves and 1 30-inch and 2 36-inch hydraulic lift valves.	5	37,253 00	32,416 00 ²	Crane Co., Chicago, Ill. (Valve Shop at Bridgeport, Conn.)
81 ¹	Furnishing and laying 60-inch electric-welded steel water pipes in Newton.	7	97,700 00	95,145 00 ²	C. and R. Construction Co., Boston.
82 ¹	Furnishing Venturi meters.	-3	-3	-3	Builders Iron Foundry, Providence, R. I.
83	Furnishing and laying 60-inch electric-welded steel water pipes in Newton and Watertown.	10	121,860 00	121,455 00 ²	Thomas Joseph McCue, Watertown, Mass.
35-M	Sale and purchase of electric energy to be developed at Wachusett Dam in Clinton.	-3	-3	-3	New England Power Company and Edison Electric Illuminating Company of Boston.

¹ Contract completed.
² Contract based upon this bid.
³ Competitive bids were not received.

APPENDIX No. 2

THE YEAR 1931—WATER DIVISION

1931 have been given in previous reports.)

7	8	9	10
Date of Contract	Date of Completion of Contract	Prices of Principal Items of Contract	Value of Work done Dec. 31, 1931
Aug. 30, 1930	Sept. 23, 1931	See Annual Report for 1930.	\$43,271 18
Oct. 11, 1930	Feb. 3, 1931	See Annual Report for 1930.	4,571 35
Feb. 11, 1931	Nov. 23, 1931	For furnishing and laying electric-welded steel pipes, \$18.00 per lin. ft.; for laying 6-inch, 12-inch, 16-inch and 20-inch cast-iron pipes, furnished by the Commonwealth, \$1.00 per lin. ft.; for earth excavation \$4.00 per cu. yd.; for chambers for 36-inch gate valves \$100.00 per chamber; for chambers for blow-off, by-pass, connection and air valves and manholes \$60.00 per chamber; for concrete masonry \$8.00 per cu. yd.; for resurfacing bituminous macadam and granite block pavements \$1.40 per sq. yd.; for resurfacing sheet asphalt on concrete base pavement, \$4.00 per sq. yd.	205,719 55
Mar. 2, 1931	-	For screw-lift valves,—12-inch \$225, 16-inch \$290, 20-inch \$375, 36-inch \$1,400; for hydraulic lift valves,—30-inch \$1,526, 36-inch \$1,725 each.	32,621 10
April 30, 1931	Dec. 8, 1931	For furnishing and laying electric-welded steel pipes, \$14.40 per lin. ft.; for laying 6-inch, 12-inch, 16-inch and 20-inch cast-iron pipes, furnished by the Commonwealth, \$1.00 per lin. ft.; for rock excavation \$0.50 per cu. yd.; for chambers for 36-inch gate valves, blow-off, by-pass, connection and air valves and manholes \$60 per chamber; for concrete masonry, \$8.00 per cu. yd.	100,648 99
April 11, 1931	June 30, 1931	For 2 16-inch by 8-inch Standard Venturi meter tubes, \$450 each; 3 20-inch by 5¼-inch Standard Venturi meter tubes, \$675 each; for 6 Special Metropolitan Type "Y" Register-indicator-recorders, \$625 each.	6, 675 00
June 2, 1931	-	For furnishing and laying electric-welded steel pipes, \$13.70 per lin. ft.; for laying 12-inch, 16-inch and 20-inch cast-iron pipes, furnished by the Commonwealth, \$1.00 per lin. ft.; for rock excavation above grade \$1.70 per cu. yd.; for rock excavation below grade, \$15.00 per cu. yd.; for earth excavation below grade, \$3.00 per cu. yd.; for chambers for 36-inch gate valves, \$100.00 per chamber; for chambers for blow-off, by-pass and connection valves, \$65.00 per chamber; for chambers for air valves and manholes, \$50.00 per chamber; for concrete masonry, \$6.00 per cu. yd.; for resurfacing bituminous macadam pavement, \$1.00 per sq. yd.; for resurfacing granolithic sidewalks, \$2.50 per sq. yd.	132,500 00
Mar. 1, 1929	-	Sale and purchase to include on week days, excepting Saturday afternoons and legal holidays, all electricity generated after deduction of that used by Commission in connection with operation of its works in Wachusett Section. Contract to continue until terminated by either party by giving 6 months' notice, but not earlier than March 1, 1939.	126,649 34

CONTRACTS MADE AND PENDING DURING

1 Num- ber of Con- tract	2 WORK	3 Num- ber of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
36-M	Sale and purchase of electric energy to be developed at Sudbury Dam in Southborough.	-3	-3	-3	Edison Electric Illuminating Company of Boston.
46-M ¹	Furnishing vertical fire-tube boilers at Chestnut Hill Pumping Station No. 1 and at Spot Pond Pumping Station.	5	\$18,404 00	\$17,949 00 ²	International Engineering Works, Inc., Framingham.
47-M ¹	Furnishing and erecting fences at Chestnut Hill Reservoir	13	10,963 40	10,877 30 ²	Beacon Equipment Co., Brookline.
48-M ¹	Removing old and erecting new boilers at Chestnut Hill Pumping Station No. 1 and at Spot Pond Pumping Station.	5	3,136 00	2,550 00 ²	F. Pritchard & Son, Inc., Watertown
49-M ¹	Relocating southern high service 36-inch pipe line crossing N. Y., N. H. & H. R.R. at Morton Street Bridge, Dorchester.	-3	-3	-3	Walsh Holyoke Steam Boiler Works, Inc., Holyoke.
50-M ¹	Non-heat-conducting covering of boilers at Chestnut Hill Pumping Station No. 1 and at Spot Pond Pumping Station.	5	1,714 00	1,536 00 ²	Standard Asbestos Covering Co., Inc., Boston.
51-M	Repairing roofs of Chestnut Hill Pumping Stations.	4	1,425 00	1,165 00 ²	Atlantic Roofing and Skylight Works, Boston.
52-M	Rewinding stators and furnishing and installing new field coil washers and wedges of generators, Wachusetts Power Station.	-3	-3	-3	Westinghouse Electric & Manufacturing Company, Boston.

¹ Contract completed.² Contract based upon this bid.³ Competitive bids were not received.

THE YEAR 1931—WATER DIVISION—Continued

7	8	9	10
Date of Contract	Date of Completion of Contract	Prices of Principal Items of Contract	Value of Work done Dec. 31, 1931
Mar. 1, 1929	—	Sale and purchase to include all electricity generated after deduction of that used by Commission in connection with operation of its Sudbury Power Station. Contract to continue for 10 years.	\$78,897 10
April 22, 1931	Sept. 15, 1931	For furnishing 3 vertical fire-tube boilers, 98 inches in diameter and 24 feet in height, with appurtenances, for working steam pressure of 185 pounds per square inch, \$5,983 each; two at Chestnut Hill Pumping Station No. 1 and one at Spot Pond Pumping Station.	18,144 25
July 7, 1931	Oct. 29, 1931	For furnishing and erecting picket fence, \$1.895 per per linear foot.	10,894 36
July 15, 1931	Sept. 23, 1931	For removing two old boilers at Chestnut Hill Pumping Station No. 1, \$430, and two old boilers at Spot Pond Pumping Station, \$460; for unloading from car and erecting on foundations two new boilers at Chestnut Hill Pumping Station No. 1, \$990, and unloading from car, transporting and erecting on foundation one new boiler at Spot Pond Pumping Station, \$670.	2,550 00
Aug. 7, 1931	Oct. 27, 1931	For furnishing, delivering and laying 36-inch and 30-inch steel pipe, \$4,670.	4,670 00
Nov. 25, 1931	Dec. 24, 1931	For furnishing and applying non-heat-conducting covering to boilers Nos. 26 and 27, including smoke bonnets, nozzles and miscellaneous piping at Chestnut Hill Pumping Station No. 1, \$968, and to boiler No. 25, including smoke bonnets, nozzles and miscellaneous piping at Spot Pond Pumping Station, \$568.	1,536 00
Nov. 7, 1931	—	For repairing roofs of Chestnut Hill Pumping Stations Nos. 1 and 2 and Machine Shop, \$1,165.	—
Nov. 28, 1931	—	For rewinding stators and furnishing and installing new field coil washers and wedges of generators Nos. 1 and 3, \$7,000.	—

CONTRACTS MADE AND PENDING DURING THE YEAR 1931—WATER DIVISION
Concluded

Summary of Contracts, 1895 to 1931, Inclusive ¹

	Value of Work done Dec. 31, 1931
Distribution Section, 7 contracts	\$526,007 17
476 contracts completed from 1896 to 1930	21,773,264 55
Deduct for work done on 11 Sudbury Reservoir contracts by the city of Boston .	\$22,299,271 72 512,000 00
Total of 483 contracts	\$21,787,271 72

¹In this summary contracts for the sale of used material and contracts charged to maintenance are excluded.

APPENDIX No. 3

TABLE No. 1. — Monthly Rainfall in Inches at Various Places on the Metropolitan Water Works, 1931

	January	February	March	April	May	June	July	August	September	October	November	December	Totals
Wachusett Watershed:													
Princeton	3.13	2.84	4.22	2.80	5.20	5.96	3.44	7.80	1.74	2.53	1.54	3.37	44.57
Jefferson	3.42	3.28	4.82	3.07	5.24	6.75	2.86	7.62	2.63	2.31	1.34	3.78	47.12
Sterling	3.54	2.42	5.40	2.85	4.21	5.77	2.17	7.05	1.72	2.42	1.32	3.61	42.48
Boylston	3.69	2.29	5.56	3.20	5.39	5.79	2.38	5.31	2.08	2.58	1.19	3.76	43.22
Sudbury Watershed:													
Sudbury Dam	4.01	2.48	6.28	3.07	3.74	6.62	1.48	5.07	1.17	2.23	0.94	3.26	40.35
Framingham	4.32	2.63	5.55	3.21	4.03	6.67	1.77	5.30	1.19	2.03	0.95	3.42	41.07
Ashland Dam	3.63	2.44	5.52	2.99	3.83	8.30	1.76	4.29	1.26	2.20	0.91	3.15	40.28
Cordaville	3.86	2.71	6.22	3.19	3.87	7.13	1.63	5.07	1.14	2.45	1.01	3.34	41.62
Lake Cochituate	3.76	2.65	6.27	2.92	4.02	6.96	2.22	5.62	1.57	2.50	0.95	3.48	42.92
Chestnut Hill Reservoir	3.78	3.47	4.91	3.08	4.42	9.14	1.89	5.77	1.90	2.33	0.92	3.16	44.77
Spot Pond	4.06	3.84	5.40	2.87	3.89	8.67	2.10	4.49	1.31	2.43	1.17	3.63	43.86
Average of all	3.75	2.82	5.47	3.02	4.35	7.07	2.15	5.76	1.61	2.37	1.11	3.45	42.93
Average, Wachusett Watershed	3.45	2.71	5.00	2.98	5.01	6.07	2.71	6.94	2.04	2.46	1.35	3.63	44.35
Average, Sudbury Watershed	3.96	2.56	5.89	3.12	3.87	7.18	1.66	4.93	1.19	2.23	0.95	3.29	40.83

TABLE NO. 2. — Rainfall in Inches at Chestnut Hill Reservoir, 1931

DATE	Amount	Duration	DATE	Amount	Duration
Jan. 5 . . .	1.27	5.20 P.M. to 6. A.M.	July 14 . . .	.18	8.00 A.M. to 9.30 A.M.
Jan. 6 . . .	.05 ¹	7.00 A.M. to 4.20 P.M.	July 15 . . .	.04	9.55 P.M. to 1.15 A.M.
Jan. 6 . . .	.83 ¹	10.30 A.M. to 1.00 A.M.	July 16 . . .	.01	3.35 A.M. to 5.45 A.M.
Jan. 12 . . .	.70 ¹	7.00 A.M. to 7.00 P.M.	July 21 . . .	.05	3.25 A.M. to 4.25 A.M.
Jan. 13 . . .	.12 ²	9.30 A.M. to 3.00 P.M.	July 22 . . .	.09	9.20 A.M. to 11.00 A.M.
Jan. 19 . . .	.81 ²	5.40 P.M. to 1.00 P.M.	July 22 . . .	.06	8.00 A.M. to 10.30 A.M.
Jan. 29 . . .			July 24 . . .	.02	6.30 P.M. to 7.00 P.M.
Jan. 30 . . .			July 24 . . .	.07	8.15 P.M. to 9.30 P.M.
Jan. 31 . . .			July 29 . . .		
Total . . .	3.78		Total . . .	1.89	
Feb. 2 . . .	.06 ²	1.00 A.M. to 7.00 A.M.	Aug. 2 . . .	.06	10.05 P.M. to 3.50 A.M.
Feb. 7 . . .	.26 ¹	11.40 P.M. to 11.30 P.M.	Aug. 3 . . .	.10	7.30 P.M. to 10.40 P.M.
Feb. 8 . . .	.50 ²	7.00 A.M. to 7.00 A.M.	Aug. 3 . . .	.15	3.10 P.M. to 3.30 P.M.
Feb. 9 . . .	.32 ¹	10.45 P.M. to 12.00 M.	Aug. 7 . . .	.03	7.45 A.M. to 1.00 A.M.
Feb. 10 . . .	2.33 ¹	1.15 A.M. to 6.30 P.M.	Aug. 10 . . .	1.88	11.20 P.M. to 5.00 P.M.
Feb. 13 . . .			Aug. 11 . . .	.18	2.20 P.M. to 3.15 P.M.
Feb. 14 . . .			Aug. 11 . . .	.13	11.45 A.M. to 5.30 P.M.
Feb. 18 . . .			Aug. 12 . . .	.18	11.55 A.M. to 3.10 P.M.
Feb. 20 . . .			Aug. 14 . . .	.04	10.00 P.M. to 1.00 A.M.
Total . . .	3.47		Aug. 24 . . .	.17	1.00 P.M. to 9.40 P.M.
Mar. 3 . . .	.69 ²	2.45 P.M. to 10.00 A.M.	Aug. 27 . . .	2.81	5.20 A.M. to 5.40 P.M.
Mar. 5 . . .	.04	9.00 A.M. to 10.00 A.M.	Aug. 28 . . .	.04	10.00 P.M. to 10.30 P.M.
Mar. 6 . . .	2.07 ¹	7.50 A.M. to 11.40 P.M.	Aug. 30 . . .		
Mar. 8 . . .	.04 ¹	4.15 A.M. to 6.45 A.M.	Total . . .	5.77	
Mar. 10 . . .	.08 ¹	7.50 A.M. to 12.45 A.M.	Sept. 2 . . .	.56	9.00 P.M. to 6.30 A.M.
Mar. 11 . . .	.73 ¹	2.40 A.M. to 10.00 A.M.	Sept. 3 . . .	.17	10.30 A.M. to 8.30 P.M.
Mar. 16 . . .	1.26	9.40 P.M. to 8.30 P.M.	Sept. 3 . . .	.07	2.45 P.M. to 3.00 P.M.
Mar. 17 . . .			Sept. 15 . . .	.52	8.30 P.M. to 12.45 A.M.
Mar. 25 . . .			Sept. 15 . . .	.08	5.00 A.M. to 2.00 P.M.
Mar. 26 . . .			Sept. 17 . . .	.27	6.30 A.M. to 10.00 P.M.
Mar. 28 . . .			Sept. 20 . . .	.02	6.30 P.M. to 9.45 P.M.
Mar. 29 . . .			Sept. 22 . . .	.11	10.00 A.M. to 10.30 A.M.
Total . . .	4.91		Sept. 24 . . .	.10	4.00 P.M. to 11.45 P.M.
Apr. 1 . . .	.75	6.45 A.M. to 6.30 P.M.	Sept. 26 . . .		
Apr. 2 . . .	.29	12.15 A.M. to 6.15 A.M.	Total . . .	1.90	
Apr. 4 . . .	.55	1.00 A.M. to 4.30 A.M.	Oct. 7 . . .	.05	4.30 P.M. to 5.30 P.M.
Apr. 7 . . .	.12	3.35 A.M. to 1.45 A.M.	Oct. 8 . . .	.02	5.20 P.M. to 8.30 P.M.
Apr. 8 . . .	1.34	3.35 A.M. to 9.30 P.M.	Oct. 14 . . .	1.35	10.15 P.M. to 5.45 P.M.
Apr. 23 . . .	.03	9.00 A.M. to 3.00 P.M.	Oct. 16 . . .	.04	2.30 A.M. to 6.50 A.M.
Apr. 24 . . .			Oct. 25 . . .	.11	2.00 P.M. to 4.15 P.M.
Apr. 26 . . .			Oct. 25 . . .	.76	2.50 A.M. to 9.30 P.M.
Apr. 29 . . .			Oct. 28 . . .		
Total . . .	3.08		Oct. 29 . . .		
May 8 . . .	1.36	4.50 A.M. to 11.20 P.M.	Total . . .	2.33	
May 10 . . .	.59	9.15 A.M. to 5.00 A.M.	Nov. 2 . . .	.01	10.00 P.M. to 11.00 P.M.
May 11 . . .	1.22	2.30 A.M. to 2.15 A.M.	Nov. 3 . . .	.04	9.45 P.M. to 2.40 A.M.
May 13 . . .	.06	5.00 P.M. to 4.45 A.M.	Nov. 4 . . .	.01	1.30 P.M. to 2.30 P.M.
May 15 . . .	.55	9.00 A.M. to 4.45 P.M.	Nov. 12 . . .	.53	11.20 A.M. to 7.00 A.M.
May 16 . . .	.32	2.20 A.M. to 4.30 P.M.	Nov. 15 . . .	.02	1.00 P.M. to 5.00 P.M.
May 17 . . .	.32	10.00 P.M. to 5.15 A.M.	Nov. 21 . . .	.02	9.45 P.M. to 11.00 P.M.
May 21 . . .			Nov. 27 . . .	.29	8.00 A.M. to 4.30 P.M.
May 23 . . .			Nov. 28 . . .		
May 31 . . .			Nov. 30 . . .		
June 1 . . .			Total . . .	.92	
Total . . .	4.42		Dec. 4 . . .	.91	9.15 A.M. to 11.30 P.M.
June 1 . . .	.02	7.30 A.M. to 9.00 P.M.	Dec. 9 . . .	.43 ¹	11.45 A.M. to 12.15 A.M.
June 7 . . .	.39	11.00 A.M. to 2.00 P.M.	Dec. 10 . . .	.14	12.15 P.M. to 7.00 A.M.
June 8 . . .	5.64	8.30 P.M. to 4.15 P.M.	Dec. 11 . . .	.52	11.00 A.M. to 6.00 P.M.
June 11 . . .	.02	4.45 A.M. to 11.00 A.M.	Dec. 12 . . .	.06 ²	7.00 A.M. to 3.15 P.M.
June 12 . . .	2.77	10.30 P.M. to 12.45 P.M.	Dec. 13 . . .	.79	5.45 A.M. to 7.00 A.M.
June 15 . . .	.19	2.30 P.M. to 3.15 A.M.	Dec. 14 . . .	.28	8.15 P.M. to 2.30 A.M.
June 17 . . .	.11	9.10 P.M. to 9.45 P.M.	Dec. 20 . . .	.03	9.30 A.M. to 2.30 P.M.
June 23 . . .			Dec. 22 . . .		
June 24 . . .			Dec. 23 . . .		
June 26 . . .			Dec. 24 . . .		
Total . . .	9.14		Dec. 25 . . .		
July 1 . . .	.01	5.00 P.M. to 5.10 P.M.	Dec. 25 . . .		
July 4 . . .	.02	2.45 P.M. to 3.15 P.M.	Total . . .	3.16	
July 6 . . .	1.13	10.45 A.M. to 3.45 P.M.			
July 7 . . .	.06	1.45 P.M. to 2.30 P.M.			
July 8 . . .	.02	10.00 P.M. to 11.45 P.M.			
July 9 . . .	.13	5.55 P.M. to 7.15 A.M.			
July 10 . . .					
July 11 . . .					

Total for Year, 44.77 inches.

¹ Rain and snow.

² Snow.

TABLE No. 3. — *Wachusett System — Statistics of Flow of Water, Storage and Rainfall in 1931*
[Watershed above dam = 108.84 square miles.]

MONTH	GALLONS PER DAY										Rainfall Collected (Inches)	Rainfall Collected (Inches)	Percentage of Rainfall Collected
	Taken by Town of Clinton	Taken by City of Worcester	Received from Ware River Watershed ¹	Discharged into Wachusett Aqueduct ²	Wasted into River below Dam	Seepage through the North Dike ³	STORAGE ⁴		Total Yield of Watershed	Yield per Square Mile			
							Gain	Loss					
January	—	2,358,000	—	126,213,000	1,706,000	226,000	—	76,758,000	53,745,000	494,000	3.44	.881	25.6
February	46,000	—	—	56,022,000	1,718,000	161,000	16,582,000	—	74,529,000	685,000	2.71	1.103	40.7
March	—	—	72,400,000	42,600,000	1,710,000	235,000	305,171,000	—	277,316,000	2,548,000	5.00	4.545	90.9
April	—	—	234,350,000	501,000	1,689,000	661,000	484,453,000	—	252,628,000	2,318,000	2.98	4.001	134.3
May	84,000	—	58,084,000	43,520,000	1,745,000	784,000	149,703,000	—	137,752,000	1,266,000	5.01	2.258	45.1
June	207,000	—	57,937,000	61,173,000	1,720,000	873,000	188,697,000	—	194,733,000	1,789,000	6.07	3.089	51.0
July	—	—	—	108,442,000	1,697,000	900,000	—	68,681,000	42,358,000	389,000	2.71	0.694	25.6
August	—	—	—	156,790,000	1,723,000	855,000	—	93,284,000	66,084,000	607,000	6.95	1.083	15.6
September	—	—	—	147,425,000	1,714,000	806,000	—	117,384,000	32,561,000	300,000	2.04	.517	25.3
October	—	—	—	129,861,000	1,713,000	761,000	—	102,610,000	29,726,000	273,000	2.46	.487	19.8
November	—	—	—	112,510,000	1,713,000	717,000	—	80,530,000	34,410,000	316,000	1.35	.546	40.5
December	—	—	3,452,000	124,932,000	1,719,000	671,000	—	50,100,000	73,771,000	678,000	3.63	1.209	33.3
Total	28,000	200,000	35,399,000	92,948,000	1,714,000	640,000	45,652,000	—	105,783,000	972,000	44.35	20.413	—
Av. for Yr.	—	—	—	—	—	—	—	—	—	—	—	—	46.0

¹ Received from Ware River, not included in yield of Wachusett watershed.
² Including 158,000 gallons per day drawn from aqueduct for the supply of the Westborough State Hospital.
³ Estimated.
⁴ Aggregate storage in Wachusett Reservoir and in ponds and mill reservoirs.

TABLE No. 4. — Sudbury System — Statistics of Flow of Water, Storage and Rainfall in 1931

[Watershed=75.2 square miles.]

MONTH	GALLONS PER DAY										Rain-fall Collected (Inches)	Rain-fall Collected (Inches)	Percent- age of Rainfall Col- lected	
	Water received from Wachusett Reservoir 1	Water discharged through Sudbury Aqueduct	Water discharged through Weston Aqueduct	Water used by Fram- ingham Water Works	Water diverted from Water- shed by Sewers, etc.	Water wasted from Farm Pond	Water wasted into River below Lowest Dam	STORAGE		Total Yield Of Watershed				Yield per Square Mile
								Gain	Loss					
Jan.	126,058,000	24,919,000	80,339,000	1,516,000	561,000	287,000	6,965,000	46,529,000	—	35,058,000	466,000	0.832	21.0	
Feb.	55,854,000	19,689,000	86,768,000	1,543,000	918,000	600,000	21,579,000	1,728,000	—	76,971,000	1,024,000	1.649	64.3	
Mar.	42,445,000	16,413,000	84,535,000	1,481,000	2,029,000	732,000	86,510,000	110,387,000	—	259,642,000	3,453,000	6.159	104.5	
Apr.	354,000	21,003,000	79,758,000	1,278,000	1,776,000	280,000	64,176,000	—	21,827,000	146,090,000	1,943,000	3.12	107.5	
May	43,371,000	26,816,000	78,219,000	1,336,000	739,000	13,000	41,277,000	—	15,655,000	89,374,000	1,188,000	3.87	54.8	
June	61,020,000	31,110,000	80,353,000	1,447,000	1,483,000	353,000	84,257,000	10,337,000	—	148,320,000	1,972,000	7.18	47.4	
July	108,277,000	41,558,000	80,968,000	1,645,000	235,000	—	28,332,000	—	20,993,000	23,468,000	312,000	0.557	33.5	
Aug.	156,626,000	23,626,000	96,526,000	1,668,000	248,000	—	3,616,000	40,623,000	—	9,681,000	129,000	0.229	4.6	
Sept.	147,269,000	25,215,000	95,717,000	1,478,000	216,000	—	1,501,000	15,465,000	—	7,676,000	—102,000	—0.176	—14.8	
Oct.	129,703,000	25,939,000	97,916,000	1,339,000	306,000	—	1,500,000	671,000	—	2,032,000	—27,000	—0.048	—2.2	
Nov.	112,343,000	32,060,000	98,723,000	1,187,000	277,000	—	2,093,000	—	18,740,000	3,257,000	43,000	0.074	7.8	
Dec.	124,777,000	32,435,000	98,881,000	1,174,000	358,000	—	9,832,000	4,519,000	—	22,423,000	298,000	0.532	16.1	
Total Av. for Yr.	92,791,000	26,784,000	88,234,000	1,424,000	759,000	186,000	29,264,000	13,029,000	—	66,889,000	889,000	18.682	45.8	

¹ Not including 158,000 gallons per day drawn from the Wachusett Aqueduct for the supply of the Westborough State Hospital, not discharged into Sudbury Reservoir.

TABLE No. 5. — *Cochituate System — Statistics of Flow of Water, Storage and Rainfall in 1931*
[Watershed of Lake = 17.58 square miles. ¹]

MONTH	GALLONS PER DAY						Rainfall (Inches)	Rainfall Collected (Inches)	Percent- age of Rainfall Collected	
	Water discharged through Cochituate Aqueduct	Water diverted from Water- shed by Sewers, etc.	Water wasted at Outlet of Lake	STORAGE		Total Yield of Water- shed				Yield per Square Mile
				Gain	Loss					
January	16,684,000	555,000	—	—	4,513,000	12,726,000	724,000	3.76	1.291	34.3
February	17,475,000	775,000	—	3,586,000	—	21,836,000	1,242,000	2.65	2.001	75.5
March	22,003,000	1,768,000	15,700,000	12,529,000	—	52,000,000	2,958,000	6.27	5.276	84.2
April	17,571,000	1,732,000	10,568,000	—	634,000	29,237,000	1,663,000	2.92	2.867	98.2
May	18,174,000	1,052,000	3,290,000	—	1,839,000	20,677,000	1,176,000	4.02	2.098	52.2
June	19,177,000	1,640,000	18,036,000	—	553,000	38,300,000	2,179,000	6.96	3.761	54.0
July	17,310,000	564,000	—	—	8,039,000	9,835,000	559,000	2.22	0.998	45.0
August	15,810,000	245,000	—	—	6,713,000	9,342,000	530,000	5.62	0.948	16.9
September	15,522,000	316,000	—	—	10,768,000	5,070,000	289,000	1.57	0.499	31.8
October	11,777,000	284,000	—	—	5,771,000	6,290,000	358,000	2.50	0.638	25.5
November	—	483,000	—	3,030,000	—	3,513,000	200,000	0.95	0.345	36.3
December	—	623,000	—	6,671,000	—	7,294,000	415,000	3.48	0.740	21.3
Total Average for year	14,279,000	834,000	3,963,000	—	1,111,000	17,965,000	1,022,000	42.92	21.462	50.0

¹ Not including the watersheds of Dudley and Dug ponds.

TABLE NO. 6. — Sources from which and Periods during which Water has been drawn for the Supply of the Metropolitan Water District
From Wachusett Reservoir into the Wachusett Aqueduct

MONTH	Number of Days during which Water was Flowing	ACTUAL TIME		Million ¹ Gallons Drawn
		Hours	Minutes	
January	26	339	23	3,912.6
February	13	159	40	1,568.6
March	13	159	48	1,320.6
April	1	8	0	15.0
May	19	97	7	1,349.1
June	22	126	14	1,835.2
July	26	231	26	3,361.7
August	26	334	42	4,860.5
September	25	303	53	4,428.9
October	26	275	20	4,025.7
November	23	232	51	3,375.3
December	26	266	20	3,872.9
Totals	246	105.614 days		33,926.1

¹Including quantity supplied to Westborough State Hospital.

From Sudbury Reservoir through the Weston Aqueduct to Weston Reservoir

MONTH	Number of Days during which Water was Flowing	ACTUAL TIME		Million Gallons Drawn
		Hours	Minutes	
January	31	735 ¹	30	2,490.5 ¹
February	28	570	00	2,429.5
March	31	633	30	2,620.6
April	30	588	00	2,389.4
May	31	600	22	2,424.8
June	30	609	30	2,410.6
July	31	630	30	2,510.0
August	31	648	30	2,992.3
September	30	610	20	2,875.5
October	31	629	40	3,035.4
November	30	616	30	2,961.7
December	31	633	37	3,065.3
Totals	365	312.749 days		32,205 6

¹ Included in this time, and in the amount of water, is 605 hrs. and 2,004.4 million gallons of water by-passed.

From Framingham Reservoir No. 3 through the Sudbury Aqueduct to Chestnut Hill Reservoir

MONTH	Number of Days during which Water was Flowing	ACTUAL TIME		Million Gallons Drawn
		Hours	Minutes	
January	31	744	—	552.2
February	28	672	—	432.6
March	31	744	—	323.9
April	30	719	—	442.6
May	31	744	—	577.9
June	30	720	—	801.6
July	31	744	—	1,288.3
August	31	744	—	732.4
September	30	721	—	757.5
October	31	734	45	804.1
November	30	720	—	961.8
December	31	744	—	1,005.5
Totals	365	364.615 days		8,680.4

TABLE NO. 7. — *Average Daily Quantity of Water flowing through Aqueducts in 1931 by Months*

MONTH						Wachusett Aqueduct into Sudbury Reservoir (Gallons)	Weston Aqueduct into Metropolitan District (Gallons)	Sudbury Aqueduct into Chestnut Hill Reservoir (Gallons)	Cochituate Aqueduct into Chestnut Hill Reservoir (Gallons)
January	.	.	.	.	.	126,058,000	80,339,000	24,919,000	16,684,000
February	.	.	.	.	.	55,854,000	86,768,000	19,689,000	17,475,000
March	.	.	.	.	.	42,445,000	84,535,000	16,413,000	22,003,000
April	.	.	.	.	.	354,000	79,758,000	21,003,000	17,571,000
May	.	.	.	.	.	43,371,000	78,219,000	26,816,000	18,174,000
June	.	.	.	.	.	61,020,000	80,353,000	31,110,000	19,177,000
July	.	.	.	.	.	108,277,000	80,968,000	41,558,000	17,310,000
August	.	.	.	.	.	156,626,000	96,526,000	23,626,000	15,810,000
September	.	.	.	.	.	147,269,000	95,717,000	25,215,000	15,522,000
October	.	.	.	.	.	129,703,000	97,916,000	25,939,000	11,777,000
November	.	.	.	.	.	112,343,000	98,723,000	32,060,000	—
December	.	.	.	.	.	124,777,000	98,881,000	32,435,000	—
Average	.	.	.	.	.	92,791,000	88,234,000	26,784,000	14,279,000

TABLE No. 8.—(Meter Basis.) Average Daily Consumption of Water by Districts in the Cities and Towns supplied by the Metropolitan Water Works in 1931

MONTH	LOW SERVICE	SOUTHERN HIGH SERVICE	SOUTHERN INTERMEDIATE HIGH SERVICE	NORTHERN HIGH SERVICE	SOUTHERN EXTRA HIGH SERVICE	NORTHERN EXTRA HIGH SERVICE	Total District Supplied (Gallons)	Estimated Population	Con- sumption per In- habitant (Gallons)
	Portions of Arlington, Belmont, Boston, Chelsea, Everett, Malden, Medford, Somerville and Watertown (Gallons)	Quincy and Portions of Boston, Milton and Watertown (Gallons)	Portions of Belmont and Watertown (Gallons)	Melrose, Na- hant, Revere, Stoneham, Swampscott and Winthrop and Portions of Boston, Chelsea, Everett, Malden, Medford and Somerville (Gallons)	Portions of Boston and Milton (Gallons)	Lexington and Por- tions of Arlington and Belmont (Gallons)			
January	73,741,800	45,001,800	1,290,800	11,905,000	1,501,700	1,502,600	134,943,700	1,397,750	97
February	73,127,400	44,319,300	1,311,100	11,884,200	1,507,600	1,536,200	133,685,800	1,399,110	96
March	70,390,500	42,972,600	1,314,400	11,879,600	1,499,400	1,526,300	129,582,800	1,400,460	93
April	68,899,100	42,089,600	1,367,300	12,057,000	1,514,600	1,566,400	127,494,000	1,401,820	91
May	69,046,400	43,732,200	1,448,400	12,679,700	1,699,600	1,769,300	130,375,600	1,403,180	93
June	72,189,700	46,492,800	1,510,600	13,715,000	1,770,500	1,865,700	137,544,300	1,404,530	98
July	73,510,000	47,767,600	1,611,200	14,397,600	1,743,200	2,134,200	141,163,800	1,405,890	100
August	72,229,400	47,781,800	1,562,600	14,592,300	1,763,900	2,106,300	140,036,300	1,407,250	100
September	72,519,600	48,687,300	1,503,200	13,610,100	1,824,900	1,920,300	140,065,400	1,408,600	99
October	71,450,700	46,535,600	1,474,000	12,883,400	1,794,600	1,761,000	135,899,300	1,409,960	96
November	69,344,300	45,259,500	1,388,900	12,545,600	1,759,400	1,590,200	131,887,900	1,411,320	93
December	71,817,500	45,713,200	1,410,500	12,223,500	1,750,800	1,562,500	134,478,000	1,412,670	95
For the year	71,517,500	45,538,200	1,433,600	12,871,400	1,678,500	1,738,400	134,777,600	1,405,890	96

TABLE No. 9. — (Meter Basis.) Average Daily Consumption of Water in Cities and Towns supplied by the Metropolitan Water Works in 1931

City or town	ARLINGTON		BELMONT		BOSTON		CHELSEA		EVERETT		LEXINGTON		MALDEN	
Population	38,520		23,150		782,020		46,390		49,790		9,840		59,680	
MONTH	GALLONS		GALLONS		GALLONS		GALLONS		GALLONS		GALLONS		GALLONS	
	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita
January	1,826,500	49	1,151,700	51	91,589,900	117	3,525,800	77	5,337,400	108	548,600	57	3,523,200	60
February	1,873,800	50	1,178,200	52	90,004,400	115	3,498,200	76	5,351,200	108	548,400	56	3,623,700	61
March	1,864,000	49	1,178,100	52	86,664,600	111	3,510,100	76	4,992,300	101	562,900	58	3,590,900	61
April	1,882,400	49	1,254,000	55	84,932,800	109	3,440,200	74	4,688,200	95	570,100	58	3,689,200	62
May	1,999,900	52	1,340,100	58	86,403,500	111	3,517,100	76	4,924,400	99	657,000	67	3,838,400	65
June	2,112,700	55	1,396,200	61	90,557,700	116	3,663,700	79	5,015,600	101	678,700	69	4,005,300	67
July	2,395,600	62	1,659,000	72	92,089,600	118	3,780,500	81	4,995,200	100	735,500	75	4,269,300	72
August	2,332,900	60	1,516,700	65	91,328,500	117	3,810,600	82	4,746,900	95	727,700	74	4,215,900	71
September	2,103,500	54	1,397,500	60	92,983,500	119	3,722,100	80	4,767,800	95	702,800	71	4,213,900	70
October	1,972,900	51	1,340,100	57	90,765,200	116	3,548,900	76	4,711,700	94	699,300	71	4,007,500	67
November	1,802,900	46	1,218,900	52	88,269,700	113	3,457,400	74	4,651,800	93	663,900	67	3,858,300	64
December	1,792,900	46	1,234,800	52	91,399,300	117	3,480,400	75	4,649,400	93	669,300	67	3,739,600	62
For the year	1,997,900	52	1,323,300	57	89,753,100	115	3,580,400	77	4,900,300	98	647,800	66	3,882,700	65

TABLE No. 9. — (Meter Basis.) Average Daily Consumption of Water in Cities and Towns, etc.—Continued

City or town	MEDFORD	MONTH		MILTON		NAHANT		QUINCY		REVERE	
				GALLONS		GALLONS		GALLONS		GALLONS	
				Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita
Population	62,460			23,860		1,670		74,600		36,640	
January	3,242,800	.	.	1,630,300	69	104,700	63	5,095,100	69	2,068,800	57
February	3,208,100	.	.	1,615,800	68	111,200	67	5,181,100	70	2,056,400	57
March	3,101,300	.	.	1,615,300	68	101,800	61	5,141,300	70	2,057,900	57
April	3,017,000	.	.	1,631,000	69	118,200	71	5,077,000	69	1,987,800	55
May	3,179,000	.	.	1,698,300	71	162,300	97	5,146,300	69	2,135,700	59
June	3,340,900	.	.	1,833,500	77	296,100	177	5,603,600	75	2,451,700	67
July	3,499,800	.	.	1,744,300	73	362,200	217	5,630,800	75	2,732,700	75
August	3,621,200	.	.	1,759,200	74	354,700	212	5,502,200	74	2,860,700	78
September	3,543,400	.	.	1,756,300	73	303,500	182	5,400,900	72	2,481,500	67
October	3,519,900	.	.	1,578,300	66	211,600	127	5,188,800	69	2,331,100	63
November	3,455,700	.	.	1,516,900	63	167,900	100	5,090,600	68	2,134,200	58
December	3,350,900	.	.	1,527,200	63	158,200	95	5,103,900	68	2,087,700	56
For the year	3,341,100	.	.	1,659,000	70	205,000	123	5,263,800	71	2,284,300	62

TABLE No. 9. — (Meter Basis.) Average Daily Consumption of Water in Cities and Towns, etc. — Concluded

City or town	MONTH	SOMERVILLE		STONEHAM		SWAMPSCOTT		WATERTOWN		WINTHROP		METROPOLITAN DISTRICT	
		GALLONS		GALLONS		GALLONS		GALLONS		GALLONS		GALLONS	
		Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita	Per Day	Per Capita
Population		105,320		10,250		10,640		36,700		17,070		1,405,890	
January	.	9,922,500	95	656,300	64	654,600	62	2,141,500	59	1,135,500	67	134,943,700	97
February	.	10,052,900	96	687,900	68	630,300	60	2,118,800	59	1,144,400	67	133,685,800	96
March	.	9,900,600	94	674,800	66	610,100	58	2,092,800	58	1,129,200	66	129,582,800	93
April	.	9,740,400	93	684,500	67	659,300	62	2,170,000	60	1,151,300	68	127,494,000	91
May	.	9,571,200	91	689,500	67	765,100	72	2,208,200	61	1,213,800	71	130,375,600	93
June	.	10,453,900	99	705,900	69	931,000	88	2,239,100	61	1,324,400	78	137,544,300	98
July	.	10,768,200	102	701,000	68	1,069,000	100	2,310,700	63	1,523,400	89	141,163,800	100
August	.	10,700,100	101	716,600	70	1,191,000	112	2,182,000	59	1,518,700	89	140,036,300	100
September	.	10,525,000	100	690,100	67	1,013,100	95	2,192,700	59	1,283,700	75	140,065,400	99
October	.	10,181,100	96	671,200	65	772,900	72	2,173,900	59	1,176,400	69	135,899,300	96
November	.	9,924,900	94	676,600	66	668,800	62	2,147,100	58	1,177,000	69	131,887,900	93
December	.	9,880,800	93	685,800	67	612,800	57	2,038,700	55	1,169,300	68	134,478,000	95
For the year	.	10,135,000	96	686,600	67	799,300	75	2,168,100	59	1,246,600	73	134,777,600	96

TABLE No. 10. — Chemical Examinations of Water from the Wachusett Reservoir, Clinton—1931
[Parts per 100,000]

DATE OF COLLECTION	APPEARANCE		ODOR		RESIDUE ON EVAPO- RATION		AMMONIA			Chlorine	Hardness	
	Turbidity	Sediment	Cold	Hot	Total	Loss on Ignition	Free	ALBUMINOID				
								Total.	Dissolved			Suspended
Jan. 6	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	4.45	1.35	.0014	.0100	.0078	.0022	.24	1.6
Jan. 20	V. slight.	V. slight.	Faintly vegetable.	Faintly vegetable.	3.80	1.00	.0022	.0096	.0068	.0028	.28	1.8
Feb. 3	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	4.50	1.40	.0020	.0070	.0054	.0016	.31	1.7
Feb. 17	V. slight.	V. slight.	Faintly vegetable.	Faintly unpleasant.	3.75	1.00	.0160	.0076	.0064	.0012	.28	1.6
Mar. 3	V. slight.	V. slight.	Faintly vegetable.	Faintly musty.	4.40	1.25	.0068	.0034	.0026	.0008	.14	0.5
Mar. 17	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	2.95	1.00	.0050	.0064	.0040	.0024	.24	1.3
Apr. 7	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	3.75	1.40	.0024	.0076	.0062	.0014	.39	1.6
Apr. 21	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	4.00	1.10	.0008	.0072	.0056	.0016	.36	1.6
May 5	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	4.05	1.40	.0006	.0090	.0064	.0026	.25	1.0
May 19	V. slight.	V. slight.	Faintly vegetable.	Faintly vegetable.	3.55	1.15	.0014	.0072	.0054	.0018	.23	1.1
June 2	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.40	1.00	.0028	.0126	.0094	.0032	.25	1.4
June 15	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	4.05	1.55	.0004	.0080	.0062	.0018	.21	1.4
July 7	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.70	1.50	.0024	.0140	.0082	.0058	.23	1.4
July 21	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	3.95	1.40	.0032	.0104	.0078	.0026	.20	1.3
Aug. 4	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	4.05	1.55	.0066	.0120	.0086	.0034	.23	1.1
Aug. 18	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.65	1.00	.0026	.0156	.0120	.0036	.24	1.1
Sept. 8	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.70	1.30	.0014	.0140	.0098	.0042	.26	1.3
Sept. 22	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.75	1.75	.0022	.0088	.0070	.0018	.24	1.4
Oct. 6	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.65	1.45	.0030	.0082	.0064	.0018	.25	1.6
Oct. 20	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.70	1.10	.0012	.0154	.0120	.0034	.24	1.7
Nov. 3	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.55	1.00	.0016	.0104	.0072	.0032	.25	1.6
Nov. 17	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	4.00	1.35	.0016	.0136	.0098	.0038	.25	1.6
Dec. 8	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	3.90	1.45	.0006	.0068	.0056	.0012	.26	1.3
Dec. 22	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.65	1.20	.0020	.0088	.0068	.0020	.25	1.3
Average . . . . .	.....	.....	.....	.....	3.83	1.28	.0029	.0097	.0072	.0025	.25	1.4

TABLE No. 11. — Chemical Examinations of Water from the Sudbury Reservoir—1931

[Parts per 100,000]

DATE OF COLLECTION	APPEARANCE		ODOR		RESIDUE ON EVAPO- RATION		AMMONIA			Chlorine	Hardness	
	Turbidity	Sediment	Cold	Hot	Total	Loss on Ignition	Free	ALBUMINOID				
								Total	Dissolved			Suspended
Jan. 6 . . .	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	3.75	1.20	.0008	.0082	.0056	.0026	.33	1.1
Feb. 3 . . .	V. slight.	V. slight.	Faintly vegetable.	Faintly vegetable.	4.45	1.40	.0016	.0084	.0050	.0034	.33	1.8
Mar. 3 . . .	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	4.70	1.90	.0032	.0058	.0046	.0012	.32	1.7
Apr. 7 . . .	V. slight.	V. slight.	V. faintly vegetable.	Faintly fishy.	5.70	1.75	.0032	.0104	.0090	.0014	.35	1.7
May 5 . . .	V. slight.	V. slight.	Faintly fishy.	Faintly fishy.	4.65	1.35	.0008	.0122	.0092	.0030	.39	2.0
June 2 . . .	V. slight.	V. slight.	Faintly vegetable.	Faintly vegetable.	4.90	1.40	.0032	.0132	.0098	.0034	.38	2.2
July 7 . . .	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	5.35	1.85	.0014	.0150	.0110	.0040	.32	2.2
Aug. 4 . . .	V. slight.	V. slight.	Faintly fishy.	Faintly fishy.	3.55	1.50	.0006	.0116	.0086	.0030	.31	1.7
Sept. 8 . . .	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	2.40	1.00	.0008	.0122	.0082	.0040	.40	1.4
Oct. 6 . . .	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.95	1.55	.0044	.0086	.0060	.0026	.29	1.4
Nov. 3 . . .	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.55	1.20	.0016	.0120	.0074	.0046	.28	1.7
Dec. 8 . . .	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	3.90	1.20	.0012	.0082	.0066	.0016	.28	1.7
Average . . .	.....	.....	.....	.....	4.24	1.44	.0019	.0105	.0076	.0029	.33	1.7

TABLE No. 12 — Chemical Examinations of Water from Spot Pond, Stoneham—1931

[Parts per 100,000]

Jan.	5	V. slight.	V. slight.	V. faintly vegetable.	3.60	1.00	.0014	.0090	.0066	.0024	.32	1.3
Feb.	2	V. slight.	V. slight.	Faintly vegetable.	4.50	1.35	.0008	.0084	.0056	.0028	.28	1.4
Mar.	2	V. slight.	V. slight.	V. faintly vegetable.	4.25	1.40	.0026	.0052	.0044	.0008	.36	1.7
Apr.	6	V. slight.	V. slight.	V. faintly vegetable.	3.80	1.10	.0006	.0062	.0044	.0018	.34	1.6
May	4	V. slight.	V. slight.	Faintly vegetable.	3.55	1.25	.0006	.0126	.0088	.0038	.35	1.7
June	1	V. slight.	V. slight.	V. faintly vegetable.	4.80	1.30	.0012	.0098	.0072	.0026	.36	1.8
July	6	V. slight.	V. slight.	V. faintly vegetable.	4.75	1.80	.0014	.0114	.0094	.0020	.46	1.8
Aug.	3	V. slight.	V. slight.	V. faintly vegetable.	4.50	1.65	.0026	.0120	.0074	.0046	.45	2.0
Sept.	8	V. slight.	V. slight.	V. faintly vegetable.	5.00	1.50	.0008	.0120	.0084	.0036	.45	1.7
Oct.	5	V. slight.	V. slight.	V. faintly vegetable.	8.75	1.70	.0028	.0112	.0104	.0008	.51	1.4
Nov.	2	V. slight.	V. slight.	Faintly vegetable.	4.70	1.50	.0006	.0134	.0086	.0048	.41	2.0
Dec.	7	V. slight.	V. slight.	Faintly vegetable.	4.75	1.65	.0008	.0110	.0080	.0030	.37	1.7
Average		.....		.....	4.75	1.43	.0014	.0102	.0074	.0028	.39	1.7

TABLE No. 13. — *Chemical Examinations of Water from Lake Cochituate—1931*
[Parts per 100,000]

DATE OF COLLECTION	APPEARANCE		ODOR		RESIDUE ON EVAPO- RATION		AMMONIA			Chlorine	Hardness	
	Turbidity	Sediment	Cold	Hot	Total	Loss on Ignition	Free	ALBUMINOID				
								Total	Dissolved			Suspended
Jan. 7	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	8.35	1.95	.0028	.0152	.0108	.0044	.90	3.3
Feb. 4	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	7.95	2.00	.0022	.0112	.0088	.0024	.94	3.4
Mar. 4	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	8.05	1.85	.0148	.0126	.0106	.0020	.94	3.5
Mar. 11	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	8.40	2.10	.0370	.0140	.0126	.0014	1.04	3.5
Apr. 8	V. slight.	V. slight.	Faintly vegetable.	Faintly vegetable.	8.30	2.00	.0180	.0136	.0112	.0024	.98	3.5
May 6	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	8.25	1.75	.0142	.0122	.0092	.0030	.98	3.4
June 3	V. slight.	Slight.	V. faintly vegetable.	V. faintly vegetable.	9.10	2.10	.0064	.0134	.0114	.0020	.98	3.8
July 8	V. slight.	None.	V. faintly vegetable.	Faintly vegetable.	8.55	2.55	.0174	.0174	.0134	.0040	.93	3.3
Aug. 5	V. slight.	Slight.	V. faintly vegetable.	Faintly vegetable.	8.35	2.30	.0078	.0196	.0138	.0058	.92	3.5
Sept. 9	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	8.60	2.55	.0008	.0160	.0126	.0034	.95	3.5
Oct. 7	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	8.70	2.75	.0042	.0122	.0104	.0018	.95	3.5
Nov. 4	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	8.10	2.10	.0028	.0124	.0086	.0038	.93	3.5
Dec. 9	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	8.50	1.90	.0102	.0136	.0108	.0028	.93	3.5
Average . . . . .	. . . . .	. . . . .	. . . . .	. . . . .	8.40	2.15	.0107	.0141	.0111	.0030	.95	3.5

TABLE No. 14. — *Chemical Examinations of Water from a Tap at the State House, Boston—1931*
[Parts per 100,000.]

Jan.	5	.	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	4.25	1.10	.0016	.0072	.0060	.0012	.40	1.7
Feb.	2	.	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	6.00	1.75	.0016	.0064	.0054	.0010	.44	2.0
Mar.	2	.	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	5.15	1.65	.0028	.0082	.0068	.0014	.48	2.0
Apr.	6	.	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	5.50	1.80	.0028	.0092	.0058	.0034	.48	2.2
May	4	.	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	5.15	1.45	.0018	.0098	.0078	.0020	.48	2.0
June	1	.	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	5.70	2.00	.0006	.0140	.0104	.0036	.54	2.2
July	6	.	V. slight.	V. slight.	V. faintly vegetable.	Faintly vegetable.	6.10	1.95	.0012	.0130	.0098	.0032	.46	2.2
Aug.	3	.	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	4.55	1.70	.0006	.0108	.0094	.0014	.43	1.8
Sept.	8	.	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	4.10	1.75	.0008	.0120	.0080	.0040	.46	2.1
Oct.	5	.	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	4.60	1.55	.0008	.0100	.0052	.0048	.42	2.0
Nov.	2	.	V. slight.	V. slight.	V. faintly vegetable.	V. faintly vegetable.	4.00	1.70	.0008	.0088	.0072	.0016	.40	1.6
Dec.	7	.	V. slight.	V. slight.	Faintly vegetable.	Dist. vegetable.	3.50	1.30	.0006	.0072	.0044	.0028	.36	1.6
Average		.					4.88	1.64	.0013	.0097	.0072	.0025	.45	2.0

TABLE No. 15. — *Chemical Examinations of Water from a Faucet in Boston, 1898–1931*
[Parts per 100,000]

YEAR	COLOR	RESIDUE ON EVAPORATION		AMMONIA				Chlorine	Oxygen Consumed	Hardness
	Platinum Standard	Total	Loss on Ignition	Free	ALBUMINOID					
					Total	Dis-solved	Sus-pended			
1898 . . . . .	.40	4.19	1.60	.0008	.0152	.0136	.0016	.29	.44	1.4
1899 . . . . .	.28	3.70	1.30	.0006	.0136	.0122	.0014	.24	.35	1.1
1900 . . . . .	.29	3.80	1.20	.0012	.0157	.0139	.0018	.25	.38	1.3
1901 . . . . .	.29	4.43	1.64	.0013	.0158	.0142	.0016	.30	.42	1.7
1902 . . . . .	.30	3.93	1.56	.0016	.0139	.0119	.0020	.29	.40	1.3
1903 . . . . .	.29	3.98	1.50	.0013	.0125	.0110	.0015	.30	.39	1.5
1904 . . . . .	.23	3.93	1.59	.0023	.0139	.0121	.0018	.34	.37	1.5
1905 . . . . .	.24	3.86	1.59	.0020	.0145	.0124	.0021	.35	.35	1.4
1906 . . . . .	.24	3.86	1.39	.0018	.0159	.0134	.0025	.34	.36	1.3
1907 . . . . .	.22	3.83	1.40	.0013	.0129	.0109	.0020	.33	.32	1.3
1908 . . . . .	.19	3.50	1.35	.0011	.0115	.0092	.0024	.33	.26	1.2
1909 . . . . .	.18	3.46	1.43	.0011	.0128	.0103	.0025	.28	.25	1.3
1910 . . . . .	.14	3.05	1.24	.0013	.0118	.0102	.0016	.28	.22	1.1
1911 . . . . .	.25	4.18	1.66	.0015	.0156	.0128	.0029	.38	.33	1.4
1912 . . . . .	.17	3.86	1.23	.0018	.0154	.0119	.0034	.36	.29	1.7
1913 . . . . .	.13	3.96	1.15	.0014	.0150	.0120	.0026	.35	.26	1.5
1914 . . . . .	.14	4.12	1.19	.0014	.0138	.0116	.0022	.39	.25	1.4
1915 . . . . .	.16	3.73	1.04	.0015	.0157	.0134	.0023	.38	.25	1.4
1916 . . . . .	.18	4.53	1.85	.0013	.0133	.0107	.0026	.36	-	1.4
1917 . . . . .	.15	4.45	1.68	.0015	.0142	.0124	.0018	.33	-	1.3
1918 . . . . .	.18	3.89	1.45	.0019	.0154	.0128	.0026	.29	-	1.4
1919 . . . . .	.20	4.28	1.41	.0010	.0130	.0108	.0022	.36	-	1.5
1920 . . . . .	.17	4.23	1.35	.0012	.0112	.0097	.0014	.33	-	1.5
1921 . . . . .	.13	3.80	1.39	.0006	.0104	.0089	.0015	.25	-	1.4
1922 . . . . .	.16	3.98	1.55	.0011	.0097	.0080	.0017	.30	-	1.8
1923 . . . . .	.15	3.90	1.45	.0011	.0100	.0090	.0010	.26	-	1.5
1924 . . . . .	.12	4.10	1.60	.0011	.0109	.0084	.0025	.28	-	1.5
1925 . . . . .	.09	3.98	1.62	.0013	.0109	.0093	.0016	.29	-	1.5
1926 . . . . .	.10	4.18	1.68	.0015	.0115	.0092	.0023	.32	-	1.5
1927 . . . . .	.22	4.47	1.62	.0013	.0111	.0101	.0018	.34	-	1.9
1928 . . . . .	.27	4.43	1.72	.0011	.0124	.0106	.0018	.37	-	1.5
1929 . . . . .	.21	4.26	1.71	.0007	.0106	.0074	.0032	.30	-	1.3
1930 . . . . .	.16	4.07	1.34	.0012	.0071	.0055	.0016	.34	-	1.3
1931 . . . . .	.24	4.88	1.64	.0013	.0097	.0072	.0025	.45	-	2.0

TABLE No. 16. — *Number of Bacteria per Cubic Centimeter in Water from Various Parts of the Metropolitan Water Works, 1898–1931. (Averages of Weekly Determinations.)*

YEAR	CHESTNUT HILL RESERVOIR			SOUTHERN SERVICE TAPS	
	Sudbury Aqueduct Terminal Chamber	Cochituate Aqueduct	Effluent Gate-house No. 2	Low Service, 182 Boylston Street	High Service, 20 Somerset Street
1898	207	145	111	96	—
1899	224	104	217	117	123
1900	248	113	256	188	181
1901	225	149	169	162	168
1902	203	168	121	164	246
1903	76	120	96	126	243
1904	347	172	220	176	355
1905	495	396	489	231	442
1906	231	145	246	154	261
1907	147	246	118	130	176
1908	162	138	137	136	148
1909	198	229	119	150	195
1910	216	—	180	178	213
1911	205	204	151	175	197
1912	429	450	227	249	259
1913	123	243	157	119	140
1914	288	—	252	174	220
1915	163	—	128	117	134
1916	128	—	85	102	105
1917	178	112	119	119	141
1918	1,163	168	705	317	544
1919	92	85	100	70	84
1920	148	86	108	113	112
1921	103	—	83	92	92
1922	163	—	153	160	172
1923	229	—	178	217	230
1924	137	—	96	150	160
1925	144	251	120	155	174
1926	167	—	118	130	137
1927	119	185	70	81	101
1928	144	32	86	106	106
1929	128	—	84	130	144
1930	107	—	66	105	123
1931	82*	4*	43	80	101

*After the water was sterilized with chlorine.

TABLE No. 17. — Colors of Water from Various Parts of the Metropolitan Water Works in 1931. (Averages of Weekly Determinations.)

[Platinum Standard]

MONTH	WACHUSETT RESERVOIR						FRAM-INGHAM RESERVOIR No. 3		LAKE COCHITUATE			CHESTNUT HILL RESERVOIR			SPOT POND	FELLS RESERVOIR	NORTHERN SERVICE		SOUTHERN SERVICE	
	Surface	Mid-depth	Bottom	Worcester St. Bridge	Quinapoxet River	Stillwater River	Surface	Mid-depth	Surface	Mid-depth	Bottom	Inlet (Sudbury Aqueduct)	Inlet (Cochituate Aqueduct)	Effluent Gate-house No. 2	Mid-depth	Effluent Gate-house	Tap at Glenwood Yard, Medford (Low Service)	Tap at Glenwood Yard, Medford (High Service)	Tap at 182 Boylston Street, Boston (Low Service)	Tap at 20 Somerset Street, Boston (High Service)
January .	13	13	13	38	44	33	14	13	14	15	18	21	15	18	10	10	15	15	16	16
February .	12	13	13	41	51	38	18	21	24	24	-	25	24	20	10	10	19	19	20	20
March .	18	19	17	49	55	45	26	26	24	24	24	28	24	23	11	11	25	25	25	25
April .	25	26	24	62	78	58	31	29	22	22	23	35	22	24	15	12	25	27	27	27
May .	26	26	26	74	112	71	35	31	23	23	41	35	23	26	14	15	29	32	32	32
June .	26	25	24	38	63	48	31	29	30	22	84	26	29	23	16	13	26	29	28	28
July .	26	25	25	31	45	43	28	27	30	22	141	24	29	23	16	16	24	26	26	26
August .	25	26	-	30	66	51	26	26	28	23	72	24	27	23	18	19	25	25	25	25
September .	24	25	26	26	54	33	24	25	25	23	149	22	24	21	18	16	23	23	23	23
October .	25	25	24	27	59	36	24	24	26	27	57	23	-	21	19	18	24	24	24	24
November .	25	24	24	35	54	44	24	24	24	25	25	23	-	21	19	19	23	22	22	22
December .	24	24	24	35	54	44	24	24	24	25	25	23	-	21	19	19	23	22	22	22
Mean .	22	22	22	41	62	45	25	25	25	23	63	26	24	22	15	14	23	15	24	24

TABLE No. 18. — *Temperatures of Water from Various Parts of the Metropolitan Water Works in 1931. (Averages of Weekly Determinations.)*

[The temperatures are taken at the same places and times as the samples for microscopical examination; the depth at place of observation is from high-water mark.]
[Degrees Fahrenheit.]

MONTH	WACHUSETT ¹ RESERVOIR (DEPTH AT PLACE OF OBSERVATION 107 FEET)			SUDBURY ¹ RESERVOIR (DEPTH AT PLACE OF OBSERVATION 54.5 FEET)			WACHU- SETT AQUE- DUCT			FRAMINGHAM ¹ RESERVOIR NO. 3 (DEPTH AT PLACE OF OBSERVATION 20.5 FEET)			LAKE COCHITUATE ¹ (DEPTH AT PLACE OF OBSERVATION 62.0 FEET)			CHEST- NUT HILL RESER- VOIR			SPOT POND (DEPTH AT PLACE OF OBSERVATION 28.0 FEET)			NORTHERN SERVICE		SOUTHERN SERVICE	
	Surface	Mid-depth	Bottom	Surface	Mid-depth	Bottom	End of Open Channel	Surface	Mid-depth	Bottom	Surface	Mid-depth	Bottom	Surface	Mid-depth	Bottom	Effluent Gate-house No. 2	Surface	Mid-depth	Bottom	Tap at Glenwood Yard, Medford (Low Ser- vice)	Tap at Glenwood Yard, Medford (High Ser- vice)	Tap at 182 Boylston Street, Boston (Low Service)	Tap at 20 Somerset Street, Boston (High Service)	
January .	34.4	34.3	35.0	33.2	34.5	35.0	34.3	34.2	34.3	36.1	35.9	37.2	38.1	35.6	36.0	36.0	37.3	35.6	36.0	36.0	39.5	40.0	37.8	38.2	
February	33.5	36.1	36.1	33.2	34.0	35.3	34.3	36.0	36.1	35.5	35.1	37.9	38.6	35.0	36.5	36.8	38.6	37.2	36.8	36.8	37.7	40.5	39.3	40.4	
March .	35.4	36.3	36.7	35.4	36.3	36.0	37.7	37.5	37.4	—	37.3	39.0	—	37.2	37.0	38.3	38.6	37.2	38.3	38.3	40.0	40.8	49.5	50.0	
April .	44.3	43.8	41.7	47.2	49.5	44.3	48.6	49.0	49.5	47.0	46.9	45.8	44.5	47.1	45.8	48.3	47.8	47.1	48.3	48.3	49.0	48.4	56.7	57.6	
May .	53.2	52.4	50.7	56.9	55.3	52.3	51.8	58.5	59.0	55.9	57.6	51.0	49.1	54.1	54.5	55.0	55.0	54.1	55.0	55.0	55.7	54.6	66.6	66.7	
June .	67.3	56.7	55.7	69.0	64.0	59.2	39.7	67.8	68.1	62.1	67.9	53.4	50.4	67.8	65.9	64.0	66.2	67.8	64.0	64.0	64.0	68.4	74.3	74.8	
July .	76.0	59.6	60.0	75.3	71.8	66.0	64.5	76.2	74.7	70.9	76.7	54.7	52.2	74.6	73.3	70.0	73.6	74.6	70.0	70.0	70.8	72.8	75.6	75.9	
August .	74.2	63.5	57.1	74.1	72.5	68.0	62.4	75.0	76.0	72.6	75.3	54.2	50.7	75.1	73.3	68.8	75.4	75.1	73.3	73.3	74.6	72.8	70.1	70.3	
September	67.8	66.5	—	68.5	68.0	—	59.8	67.0	67.0	—	66.9	53.8	50.9	69.0	60.5	58.3	67.8	69.0	68.8	68.8	69.5	69.0	62.8	63.0	
October .	60.6	57.8	59.8	60.1	59.5	61.5	57.9	58.3	56.1	58.0	57.9	52.9	49.7	59.3	48.8	50.5	59.5	59.3	58.3	58.3	63.1	62.4	53.0	52.8	
November	50.5	50.6	51.1	50.6	49.3	51.0	50.6	47.9	49.2	47.0	47.5	49.2	48.5	49.6	48.8	50.5	49.5	49.6	50.5	50.5	53.4	52.9	53.0	52.8	
December	43.0	41.1	42.2	41.0	43.5	38.0	40.3	36.6	—	42.7	32.7	40.8	41.0	37.0	38.3	36.3	40.4	37.0	36.3	36.3	44.2	44.0	43.2	43.9	
Mean .	53.4	49.9	47.8	52.5	53.2	49.7	48.5	53.7	55.2	52.8	53.1	47.5	46.7	53.5	52.0	53.0	50.9	53.5	52.0	53.0	55.1	54.7	52.4	52.8	

¹ Surface temperatures are averages of weekly determinations. Mid-depth and bottom temperatures are averages of biweekly determinations.

TABLE No. 19. — Length of Metropolitan Water Works Main Lines and Connections and Number of Valves set in Same,
Dec. 31, 1931

[Pipes are of cast iron unless otherwise noted.]

DIAMETER OF PIPES IN INCHES																				Total
60	56	54	48	42	40	38	36	30	24	20	16	14	12	10	8	6	4			
Total length owned and op- erated Dec. 31, 1930 . . .	91,365	17,569	13,486	217,687	10,869	6,887	7,274	64,016	77,941	101,571	114,746	77,966	26	29,530	3,867	1,917	1,297	60	838,074	
Gate valves in same . . .	16	—	5	59	3	3	—	71	50	71	74	131	1	142	22	25	26	2	701	
Air valves in same . . .	123	8	12	132	6	5	6	48	46	60	76	41	—	10	1	—	—	—	574	
Length laid or relaid during 1931 (feet) . . .	24,522	—	—	—	—	—	—	265	104	93	263	116	—	700	—	47	2	—	26,112	
Gate valves in same . . .	4	—	—	—	—	—	—	—	—	—	14	5	—	3	—	4	—	—	30	
Air valves in same . . .	40	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	41	
Length abandoned during 1931 (feet) . . .	—	—	—	—	—	—	—	428	—	116	5	9	—	668	—	5	20	2	1,253	
Gate valves in same . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Air valves in same . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Length owned and operated Dec. 31, 1931 (feet) . . .	115,887 ¹	17,569 ²	13,486 ²	217,687 ³	10,869 ⁴	6,887	7,274 ²	63,853 ⁵	78,045 ⁶	101,548 ⁷	115,004 ⁸	78,073 ⁹	26	29,562 ¹⁰	3,867	1,959	1,279	58	862,933 ¹¹	
Gate valves in same . . .	20	—	5	59	3	3	—	71	50	71	88	136	1	145	22	29	26	2	731	
Air valves in same . . .	163	8	12	132	6	5	6	48	47	60	76	41	—	10	1	—	—	—	615	

¹ Includes 2,035 feet of 76-inch concrete-lined pressure tunnel; 363 feet of 76-inch mortar-lined and concrete-covered steel pipe; 21 feet of 76-inch cast-iron pipe; 85 feet of 60-inch concrete-covered steel pipe, and 68,540 feet of 60-inch steel pipe.

² Steel pipe.

³ Includes 2,087 feet of steel pipe.

⁴ Includes 1,059 feet of steel pipe.

⁵ Includes 236 feet of steel pipe.

⁶ Includes 15,512 feet of mortar-lined and covered wrought-iron pipe; 7,213 feet of cement-lined cast-iron pipe, and 19,101 feet of steel pipe.

⁷ Includes 55 feet of steel pipe.

⁸ Includes 1,319 feet of cement-lined cast-iron pipe.

⁹ Includes 1,795 feet of cement-lined cast-iron pipe.

¹⁰ Includes 627 feet of cement-lined cast-iron pipe.

¹¹ 163.43 miles.

TABLE No. 20. — *Length of Metropolitan Water Works Hydrant, Blow-off and Drain Pipes, Dec. 31, 1931*
[All pipes are of cast iron.]

	DIAMETER OF PIPES IN INCHES								Total
	24	20	16	12	10	8	6	4	
Total length in use Dec. 31, 1930 (feet)	352	292	3,732	7,128	220	1,314	4,472	1,663	19,173
Valves in same	—	—	48	117	2	20	109	48	344
Length laid or relaid in 1931 (feet)	—	—	284	190	—	—	33	7	514
Valves in same	—	—	6	4	—	—	1	1	12
Length abandoned in 1931 (feet)	—	—	—	—	—	—	20	7	27
Valves in same	—	—	—	—	—	—	2	1	3
Total length in use Dec. 31, 1931 (feet)	352	292	4,016	7,318	220	1,314	4,485	1,663	19,660 ¹
Valves in same	—	—	54	121	2	20	108	48	353

1 3.72 miles..

TABLE No. 21. — Length of Metropolitan Water Works Main Lines and Connections and Water Pipes, Four Inches in Diameter and Larger, in the Several Cities and Towns in the Metropolitan Water District, Dec. 31, 1931

By Whom Owned	INCHES															TOTALS					
	60	56	54	48	42	40	38	36	30	24	20	18	16	14	12	10	8	6	4	Feet	Miles
Met. Water Wks.	115,887	17,569	13,486	217,687	10,869	6,887	7,274	63,853	78,045	101,548	115,004	-	78,073	26	29,562	3,867	1,959	1,279	58	862,933	163.43
Arlington .	-	-	-	-	-	-	-	-	-	-	-	-	2,388	-	42,334	36,652	87,597	255,533	2,609	427,113	80.89
Belmont .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,588	27,873	60,671	209,844	269	310,245	58.76
Boston .	-	-	-	20,600	15,980	16,081	-	43,780	90,643	84,651	86,582	-	304,575	4,966	1,689,976	450,207	1,080,297	1,077,077	79,392	5,044,807	955.46
Brookline .	-	-	-	-	-	-	-	-	-	10,007	27,293	-	20,057	13,020	63,985	85,759	103,862	276,094	-	600,077	113.65
Chelsea .	-	-	-	-	-	-	-	-	-	-	4,108	-	5,176	-	5,479	40,251	34,521	152,773	6,315	248,623	47.09
Everett .	-	-	-	-	-	-	-	-	-	2,484	2,900	-	6,948	6,619	8,306	47,616	34,332	175,937	25,476	310,618	58.83
Lexington .	-	-	-	-	-	-	-	-	-	-	-	-	2,610	-	37,714	11,776	61,336	189,691	27,890	331,017	62.69
Malden .	-	-	-	-	-	-	-	-	-	-	-	-	8,891	11,118	97,876	37,482	114,784	235,187	48,213	553,551	104.84
Medford .	-	-	-	-	-	-	-	-	-	-	673	-	6,775	9,598	41,256	45,439	133,643	288,469	16,656	542,509	102.75
Melrose .	-	-	-	-	-	-	-	-	-	-	-	-	5,223	3,024	26,223	24,769	26,537	203,459	51,729	340,964	64.58
Milton .	-	-	-	-	-	-	-	-	-	-	-	-	3,415	72	51,872	23,980	84,933	222,123	9,472	395,867	74.97
Nahant .	-	-	-	-	-	-	-	-	-	-	-	-	-	10,444	5,550	11,550	13,643	38,686	57,668	137,541	26.05
Newton .	-	-	-	-	-	-	-	-	-	-	36,250	-	3,120	-	85,710	7,400	170,625	683,549	58,380	1,045,034	197.92
Quincy .	-	-	-	-	-	-	-	-	-	-	15,450	-	32,123	-	77,053	91,554	244,054	449,745	64,412	974,391	184.54
Revere .	-	-	-	-	-	-	-	-	-	-	-	-	10,600	7,416	39,343	36,069	72,325	144,918	54,405	365,076	69.14
Somerville .	-	-	-	-	-	-	-	-	-	-	5,577	367	10,094	7,942	113,087	72,609	114,471	215,473	17,095	556,715	105.44
Stoneham .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,725	175	5,110	132,994	19,887	168,891	31.99
Swampscott .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,714	21,800	7,375	116,526	7,366	163,502	30.97
Watertown .	-	-	-	-	-	-	-	-	-	-	-	-	2,991	11,372	7,628	40,468	91,327	177,769	3,333	334,888	63.43
Winthrop .	-	-	-	-	-	-	-	-	-	-	5,151	-	4,327	-	4,049	24,198	68,768	57,867	28,477	192,837	36.52
Total feet .	115,887	17,569	13,486	238,287	26,849	22,968	7,274	107,633	168,688	198,690	298,988	367	507,386	89,338	2,456,030	1,141,494	2,612,170	5,304,993	579,102	13,907,199	-
Total miles .	21.95	3.33	2.55	45.13	5.09	4.35	1.38	20.38	31.95	37.63	56.63	.07	96.09	16.92	465.16	216.19	494.73	1,004.73	109.68	-	2,633.94

TABLE NO. 22. — *Number of Service Pipes, Meters, Per Cent of Services Metered, Fire Services and Fire Hydrants in the Several Cities and Towns in the Metropolitan Water District, December 31, 1931*

CITY OR TOWN	Services	Meters	Per Cent of Services Metered	Services Used for Fire Purposes Only	Fire Hydrants
Arlington	7,098	7,098	100.00	32	835
Belmont	4,496	4,496	100.00	7	473
Boston	100,508	100,508	100.00	3,112	11,889
Chelsea	5,864	5,864	100.00	139	449
Everett	7,363	7,363	100.00	51	623
Lexington	2,459	2,459	100.00	6	476
Malden	9,727	9,700	99.72	75	722
Medford	10,727	10,727	100.00	31	1,035
Melrose	5,841	5,841	100.00	25	463
Milton	4,095	4,095	100.00	3	653
Nahant	931	931	100.00	2	144
Quincy	16,815	16,720	99.44	51	1,747
Revere	6,386	6,375	99.83	9	480
Somerville	14,141	13,985	98.90	121	1,388
Stoneham	2,363	2,353	99.58	2	184
Swampscott	2,705	2,705	100.00	5	279
Watertown	6,079	6,079	100.00	41	655
Winthrop	3,810	3,810	100.00	7	377
District Supplied	211,408	211,109	99.86	3,719	22,872
Brookline	7,742	7,736	99.92	32	977
Newton	14,829	14,829	100.00	100	1,511
Total District	233,979	233,674	99.87	3,851	25,360

TABLE No. 23. — Elevation of the Hydraulic Grade Line, in Feet, above Boston City Base for Each Month at Stations on Metropolitan Water Works during 1931

1931 MONTH	Low Service										SOUTHERN HIGH SERVICE									
	WATERTOWN WATER WORKS OFFICE, MAIN STREET		BELMONT WATER WORKS SHOP, WAVER- LEY STREET		BOSTON, BOWDOIN SQUARE ENGINE HOUSE		ALLSTON ENGINE HOUSE, HARVARD STREET		MEDFORD NEAR MYSTIC RESERVOIR		SOMERVILLE PUBLIC LIBRARY, HIGHLAND AVENUE		MALDEN WATER WORKS SHOP, GREEN STREET		CHELSEA COURT HOUSE		BOSTON, BOWDOIN SQUARE ENGINE HOUSE		QUINCY, FORBES HILL TOWER	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	197	177	190	178	186	172	165	158	167	154	167	156	167	139	162	139	-	235	209	
February	197	180	190	178	184	170	164	158	167	155	165	156	167	137	160	137	226	234	211	
March	197	173	192	178	184	170	164	157	167	155	166	158	167	137	160	137	226	234	210	
April	197	170	194	181	187	170	167	158	167	155	167	155	167	142	162	142	224	234	211	
May	196	180	194	176	184	170	168	159	167	154	167	156	167	139	160	139	221	234	202	
June	196	180	194	175	191	163	168	159	167	155	169	155	167	137	162	137	221	233	197	
July	194	173	192	157	193	172	172	160	166	155	169	153	166	139	162	139	219	232	197	
August	187	166	187	155	193	163	175	160	167	153	169	156	167	137	158	137	219	233	197	
September	184	163	183	162	189	166	173	161	165	155	169	158	165	139	158	139	219	233	200	
October	182	166	183	164	190	166	174	161	166	153	169	158	166	140	160	140	219	233	203	
November	182	173	183	171	189	161	174	160	167	153	168	151	167	146	162	146	230	234	207	
December	182	170	181	169	187	163	174	160	167	155	169	154	167	148	158	148	230	233	208	
Averages	191	173	189	170	188	167	170	159	167	154	168	156	167	140	160	140	223	234	204	

¹ Gage put in service Feb. 6, 1931.

TABLE No. 23. — Elevation of the Hydraulic Grade Line, in Feet, above Boston City Base, etc. — Concluded

NORTHERN HIGH SERVICE															
SOUTHERN HIGH SERVICE —Concluded															
QUINCY WATER WORKS SHOP															
1931 MONTH															
SOMERVILLE WATER WORKS SHOP															
REVERE WATER WORKS SHOP, BROADWAY															
LYNN ENGINE HOUSE, UNION SQUARE															
WINTHROP TOWN HALL, HERMAN STREET															
Minimum															
Maximum															
January	.	.	.	.	.	235	197	263	243	267	255	240	213	196	180
February	.	.	.	.	.	233	211	260	210	267	255	240	215	196	182
March	.	.	.	.	.	234	209	261	203	267	255	245	220	198	180
April	.	.	.	.	.	234	206	261	203	267	253	253	224	198	175
May	.	.	.	.	.	233	192	263	231	267	235	247	208	189	166
June	.	.	.	.	.	228	190	261	226	267	237	243	192	198	170
July	.	.	.	.	.	228	181	260	233	269	246	241	195	198	157
August	.	.	.	.	.	228	181	260	233	267	244	261	150	198	175
September	.	.	.	.	.	228	196	261	224	262	237	254	220	198	180
October	.	.	.	.	.	230	190	261	238	265	244	254	224	198	184
November	.	.	.	.	.	234	204	263	245	265	248	254	224	196	184
December	.	.	.	.	.	230	202	263	245	267	248	254	224	194	184
Averages	.	.	.	.	.	231	197	261	228	266	246	249	209	196	176

APPENDIX No. 4

CONTRACTS MADE AND PENDING DURING
Contracts relating to the

1 Number of Contract	2 WORK	3 Number of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
1 49 ²	Relocation of Old Mystic Valley Sewer, Aberjona River Crossing, Winchester.	6	\$4,470 00	\$4,145 00 ¹	George M. Bryne, Boston, Mass.
2 55	Section 82, Mill Brook Valley Sewer, North Metropolitan System, in Arlington.	21	10,866 00	8,080 00 ¹	N. Cibotti Co., Hyde Park, Mass.

Contracts relating to the

3 32 ²	Furnishing labor and material for making borings, New Neponset Valley Sewer, South Metropolitan System, in Milton.	3	\$1.10 per lin. ft.	\$0.95 ¹ per lin. ft.	Edward P. Healey, Roxbury, Mass.
4 38 ²	Section 111, New Neponset Valley Sewer, South Metropolitan System, in Milton and Canton.	12	152,667 50	149,675 00 ¹	Frank W. Christy, Providence, R. I.
5 39 ²	Section 112, New Neponset Valley Sewer, South Metropolitan System, in Canton.	11	155,100 00	149,147 50 ¹	C. & R. Construction Co., Boston, Mass.
6 41 ²	Section 113, New Neponset Valley Sewer, South Metropolitan System, in Canton.	10	124,900 00	121,750 00 ¹	Anthony Baruffaldi, West Somerville, Mass.
7 42	Section 114, New Neponset Valley Sewer, South Metropolitan System, in Canton.	14	118,257 00	105,950 00 ¹	V. Barletta Co., Roslindale, Mass.
8 43 ²	Section 115, New Neponset Valley Sewer, South Metropolitan System, in Canton.	17	91,692 50	91,325 00 ¹	A. D. Daddario, Boston, Mass.
9 36-A	Part of Section 109, New Neponset Valley Sewer, South Metropolitan System, in Milton.	10	187,343 50	179,585 00 ¹	V. Barletta Co., Roslindale, Mass.
10 37-A	Part of Section 110, New Neponset Valley Sewer, South Metropolitan System, in Milton.	8	247,568 00	225,704 00 ¹	J. H. Ferguson Co., Providence, R. I.
11 44 ²	Section 116, New Neponset Valley Sewer, South Metropolitan System, in Canton and Norwood.	14	76,290 00	71,770 00 ¹	A. D. Daddario, Boston, Mass.

¹ Contract based upon this bid. ² Contract completed.

APPENDIX No. 4

THE YEAR 1931. — SEWERAGE DIVISION
North Metropolitan System

7	8	9	10	
Date of Contract	Date of Completion of Work	Prices of Principal Items of Contracts made in 1931	Value of Work done Dec. 31, 1931	
June 20, 1931	Aug. 25, 1931	For excavation and refilling in trench for 26'' by 28'' concrete and brick sewer, and 20'' cast-iron pipe siphon and laying of pipe, \$25.00 per lin. ft.; for Portland cement brick masonry in sewer and man-holes, \$35.00 per cu. yd.; for Portland cement concrete masonry in trench for sewer, siphon, and special structures, \$12.00 per cu. yd.; for rock excavation in trench and retaining walls, \$3.00 per cu. yd.	\$4,219 28	1
Dec. 23, 1931	—	For excavation and refilling in trench for 20'' vitri-fied pipe main sewer and laying of pipe, \$2.50 per lin. ft.; for Portland cement brick masonry in man-holes and special structures, \$28.00 per cu. yd.; for Portland cement concrete masonry in trench and special structures, \$6.00 per cu. yd.; for Portland cement boulder concrete masonry in trench, \$3.00 per cu. yd.; for bank gravel refilling around pipe sewer in trench, \$2.50 per cu. yd.; for rock exca-vation in trench, \$0.50 per cu. yd.	—	2

South Metropolitan System

April 4, 1929	Jan. 21, 1931	—	—	—	\$14,325 36 ³	3
Apr. 11, 1930	Oct. 27, 1931	—	—	—	182,066 72	4
Apr. 14, 1930	Dec. 12, 1931	—	—	—	175,511 41	5
June 19, 1930	Oct. 25, 1931	—	—	—	144,759 15	6
Oct. 23, 1930	—	—	—	—	97,545 00	7
Oct. 16, 1930	Oct. 7, 1931	—	—	—	113,251 95	8
Nov. 13, 1930	—	—	—	—	174,116 93	9
Nov. 13, 1930	—	—	—	—	243,418 50	10
Dec. 24, 1930	Oct. 25, 1931	—	—	—	86,428 41	11

³ Contract extended at same rate to cover additional borings in Canton, Stoughton, Norwood, Walpole, Braintree, Weymouth and Quincy.

APPENDIX No. 4

CONTRACTS MADE AND PENDING DURING THE
Contracts relating to the

1 Number of Contract	2 WORK	3 Number of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
12 45 ²	Furnishing and installing new staybolts in two vertical boilers at Ward Street Pumping Station.	6	\$2,490 00	\$2,325 00 ¹	International Engineering Works, Inc., Framingham, Mass.
13 46	Section 117, New Neponset Valley Sewer, South Metropolitan System, in Norwood.	13	104,489 40	96,062 50 ¹	J. F. Fitzgerald Construction Co., Boston, Mass.
14 47	Section 119, New Neponset Valley Sewer, South Metropolitan System, in Canton.	11	47,622 00	42,112 80 ¹	Frank W. Christy, Providence, R. I.
15 48 ²	Removing two old and furnishing and placing two new vertical boilers at Ward Street Pumping Station.	4	8,983 00	8,980 00 ¹	D. M. Dillon Steam Boiler Works, Fitchburg, Mass.
16 50	Section 118, New Neponset Valley Sewer, South Metropolitan System, in Norwood and Walpole.	15	61,442 50	58,715 00 ¹	C. & R. Construction Co., Boston, Mass.
17 51	Squantum Pumping Station, including receiving reservoir pump well, building foundations, and connecting sewers.	15	39,017 50	37,630 00 ¹	A. D. Daddario, Mattapan, Mass.
18 52	Section 125, Braintree-Weymouth Sewer, South Metropolitan System, in Braintree and Weymouth.	8	105,325 90	100,951 00 ¹	George M. Bryne, Boston, Mass.

¹ Contract based upon this bid. ² Contract completed.

APPENDIX No. 4

YEAR 1931.—SEWERAGE DIVISION.—Continued
South Metropolitan System.—Continued

7	8	9	10	
Date of Contract	Date of Completion of Work	Prices of Principal Items of Contracts made in 1931	Value of Work done Dec. 31, 1931	
Feb. 19, 1931	May 7, 1931	For furnishing all labor, tools, materials and appliances necessary for removing old staybolts and furnishing and installing new 1½-inch staybolts in two vertical boilers.	\$2,325 00	12
Mar. 26, 1931	—	For earth excavation and refilling in trench for 48" by 51" concrete sewer, \$7.50 per lin. ft.; for earth excavation and refilling in trench and laying of pipe for 36" cast-iron pipe siphon, \$21.00 per lin. ft.; for Portland cement brick masonry in manholes, head-houses, and special structures, \$28.00 per cu. yd.; for Portland cement concrete masonry in trench for sewer, siphon and special structures, \$8.00 per cu. yd.; for Portland cement boulder concrete masonry in trench for sewer and siphon, \$6.00 per cu. yd.; for rock excavation in trench, \$2.00 per cu. yd.	84,785 50	13
Mar. 26, 1931	—	For earth excavation and refilling in trench for 33" by 36" and 24" x 27" concrete sewer and 30" cast-iron pipe crossing, \$6.16 per lin. ft.; for Portland cement brick masonry in manholes and special structures, \$32.00 per cu. yd.; for Portland cement concrete masonry in trench, pipe crossing and special structures, \$9.00 per cu. yd.; for Portland cement boulder concrete in trench, \$2.00 per cu. yd.; for rock excavation in trench, \$5.00 per cu. yd.	45,286 00	14
May 14, 1931	Nov. 6, 1931	For removing two old boilers and for furnishing all material and constructing and erecting, ready for connecting, two new vertical internally-fired boilers.	8,819 63	15
Aug. 6, 1931	—	For earth excavation and refilling in trench for 36" by 39" concrete sewer, \$6.00 per lin. ft.; for earth excavation, and refilling in trench for 30" by 33" concrete sewer and 30" cast-iron pipe, \$3.00 per lin. ft.; for Portland cement brick masonry in manholes and special structures, \$30.00 per cu. yd.; for Portland cement concrete masonry for sewer, pipe crossing and special structures, \$10.00 per cu. yd.; for Portland cement boulder concrete masonry in trench for sewer, \$2.00 per cu. yd.; for rock excavation in trench, \$6.50 per cu. yd.	26,227 50	16
Aug. 24, 1931	—	For earth excavation and refilling in receiving reservoir, pump well and building foundations, \$8,000.00 lump sum; for earth excavation and refilling in trench, for 24" x 30" concrete sewer and 16" cast-iron pipe, \$4.00 per lin. ft.; for Portland cement brick masonry in manholes and special structures, \$30.00 per cu. yd.; for Portland cement concrete masonry in sewer, receiving reservoir, pump well, building foundations and floors, \$13.00 per cu. yd.; for granite masonry in receiving reservoir and pump well, \$10 per cu. yd.; for spruce piles in trench, \$0.50 per lin. ft.; for steel reinforcing rods, beams, plates, etc., \$50.00 per ton.	10,215 00	17
Nov. 5, 1931	—	For earth excavation and refilling in harbor bed for 42" and 30" cast-iron pipe siphons including foundations, \$17.37 per lin. ft.; for furnishing and placing 42" and 30" bell and spigot cast-iron pipe, \$51.00 per ton; for earth excavation and refilling in trench for 48" by 51" concrete sewer, \$9.00 per lin. ft.; for Portland cement brick masonry in manholes, head-houses and special structures, \$35.00 per cu. yd.; for Portland cement concrete masonry in sewer, head-houses, and appurtenances in trench, \$12.00 per cu. yd.; for Portland cement boulder concrete masonry in trenches, \$10.00 per cu. yd.; for riprap paving with Portland concrete joints, \$5.00 per cu. yd.; for rock excavation in siphon trenches, \$30.00 per cu. yd.	—	18

³ Contract extended at same rate to cover additional borings in Canton, Stoughton, Norwood, Walpole, Braintree, Weymouth and Quincy.

APPENDIX No. 4

CONTRACTS MADE AND PENDING DURING THE
Contracts relating to the

1 Number of Contract	2 WORK	3 Number of Bids	AMOUNT OF BID		6 Contractor
			4 Next to Lowest	5 Lowest	
19 53	Proposed pumping units for the Squantum Pumping Station, South Metropolitan System, in Quincy.	6	\$7,780 00	\$7,775 00 ¹	Turbine Equipment Co. of New England, Boston, Mass.
20 54	Section 120, New Nepon- set Valley Sewer, South Metropolitan System, in Canton.	17	52,500 00 ¹	44,400 00	Anthony Baruffaldi, West Somerville, Mass.

¹ Contract based upon this bid.

APPENDIX No. 4

YEAR 1931—SEWERAGE DIVISION.—Continued
South Metropolitan System.—Continued

7	8	9	10	
Date of Contract	Date of Completion of Work	Prices of Principal Items of Contracts made in 1931	Value of Work done Dec. 31, 1931	
Dec. 10, 1931	—	For furnishing and erecting, ready for operation, two electrically driven pumping units including foundations, electric motors, vertical centrifugal pumps, shafting, bearings, piping, valves, railings, switchboard, controls, meters, wiring, etc., in the Pumping Station Building at Squantum, City of Quincy, Massachusetts, the lump sum of \$7,775.00.	—	19
Dec. 10, 1931	—	For excavation and refilling in trench for 27" by 36" concrete sewer, \$8.00 per lin. ft.; for excavation of earth, or rock, or both, and refilling in tunnel for 27" by 36" masonry sewer, \$30.00 per lin. ft.; for Portland cement brick masonry in manholes and special structures in trench, \$20.00 per cu. yd.; for Portland cement brick masonry in tunnel and tunnel shafts, \$20.00 per cu. yd.; for Portland cement concrete masonry in trench and special structures, \$6.00 per cu. yd.; for Portland cement concrete masonry in tunnel and tunnel shafts, \$6.00 per cu. yd.; for rock excavation in trench, \$1.00 per cu. yd.	—	20

CONTRACTS MADE AND PENDING DURING THE YEAR 1931 — SEWERAGE
DIVISION — Concluded

Summary of Contracts

	Value of Work done Dec. 31, 1931
North Metropolitan System, 2 Contracts	\$4,219 28
South Metropolitan System, 18 Contracts	1,409,082 06
Total of 20 contracts made and pending during the year 1931	\$1,413,301 34

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